VOLUME 36 NUMBER 7, PART I JULY, 1953

AMERICAN JOURNAL OF OPHTHALMOLOGY

THIRD SERIES FOUNDED BY EDWARD JACKSON

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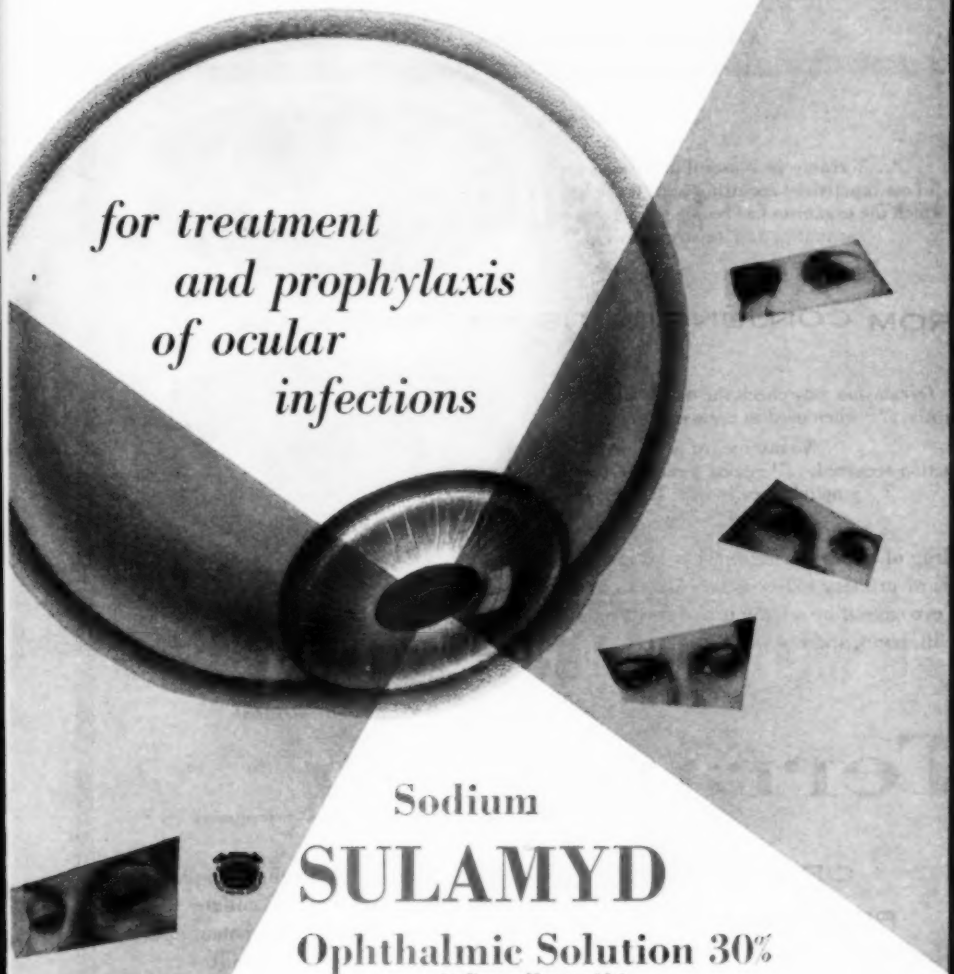

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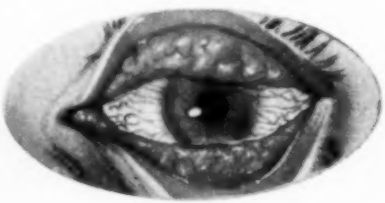

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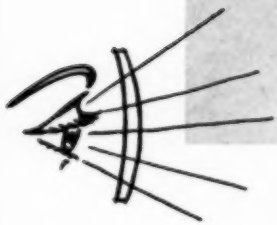

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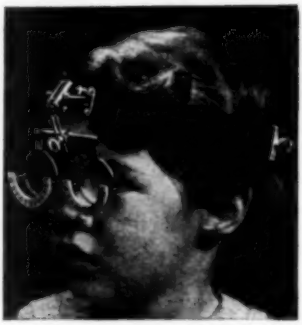

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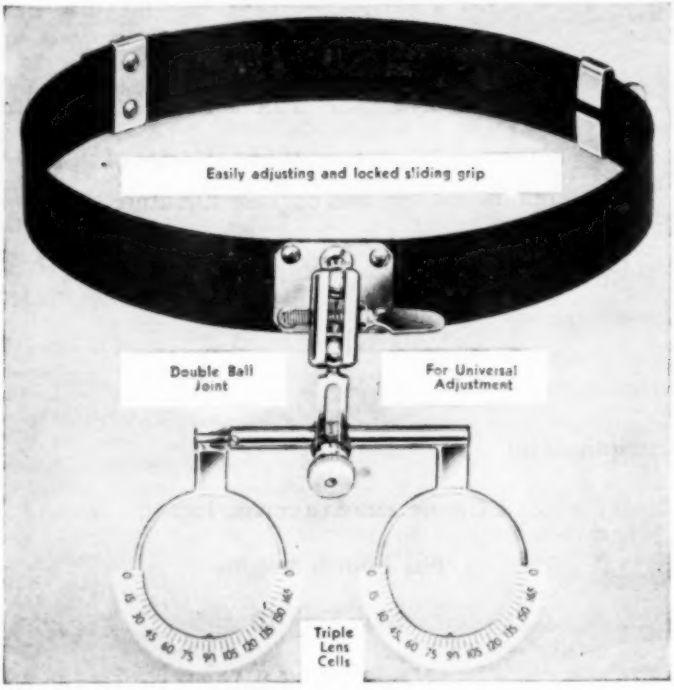

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Frontispiece illustrating article by C. C. Teng and H. M. Katzin

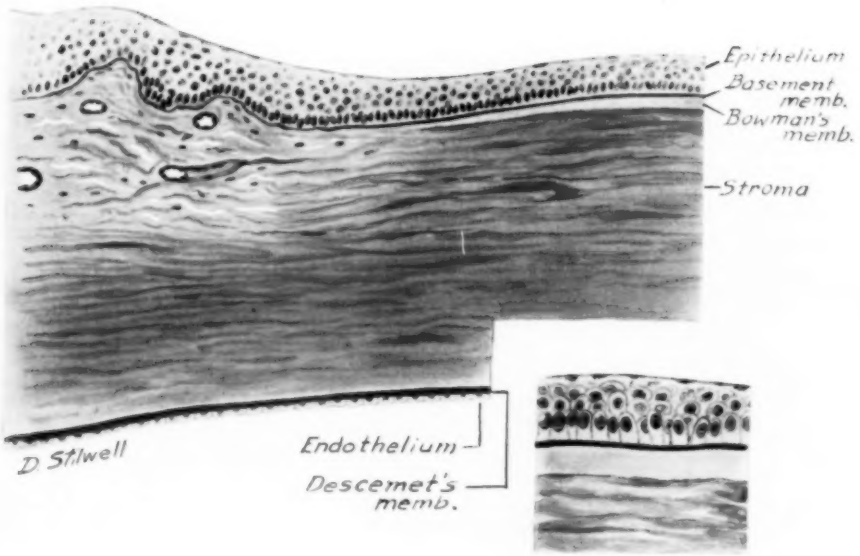

FIG. 1 (TENG AND KATZIN). HUMAN EYE. ARTIST'S REPRODUCTION OF ORIGINAL COLOR BY PERIODIC ACID FUCHSIN STAIN. REPRODUCED WITH PERMISSION OF MISS DAISY STILWELL.

AMERICAN JOURNAL OF OPHTHALMOLOGY

VOLUME 36 JULY, 1953 NUMBER 7, PART I

THE BASEMENT MEMBRANE OF CORNEAL EPITHELIUM*

A PRELIMINARY REPORT

C. C. TENG, M.D., AND H. M. KATZIN, M.D.
New York

Since Friedenwald[1] and his associates introduced the periodic-acid-fuchsin stain to ophthalmology, we have used it to study various parts of the eye. With the help of this stain, we have observed that the corneal epithelium has a very definite basement membrane which is distinguishable from Bowman's membrane. Friedenwald[2] was kind enough to examine our specimens and agreed with the observation just mentioned. A review of the literature has revealed several reports describing what we believe to be the same structure.

Reference to standard works on histology brings out the fact that most glandular epithelium has been shown to rest upon a definite basement membrane (Bailey[3]). The resemblance of the corneal and conjunctival epithelium to the mucous cavities of other glands was brought out by Rollet,[4] (1936). In the cornea, however, the demonstration of a basement membrane was more difficult because Bowman's membrane is so closely associated and has similar staining characteristics when the usual histologic stains are used.

The following authors have made observations bearing on this subject:

In 1940, Loewenstein,[5] in a paper discussing Bowman's membrane, referred to one of Fuchs's cases. The specimen was from a case of Groenouw's nodular dystrophy.

Fuchs described two kinds of corneal layering, best differentiated with Giemsa stain: (1) A uniform layer on the anterior part of Bowman's membrane, closely associated with Bowman's, and later appearing to be split when stained red with Giemsa or bluish

Fig. 2 (Teng and Katzin). Human eye. Section of cornea near edge of trephine cut. The membrane is quite heavy in this specimen.

* This work, done under the auspices of The Eye Bank for Sight Restoration, New York, was aided by the Lillia Babbitt Hyde Foundation and by the United States Public Health Service Grant B153(C).

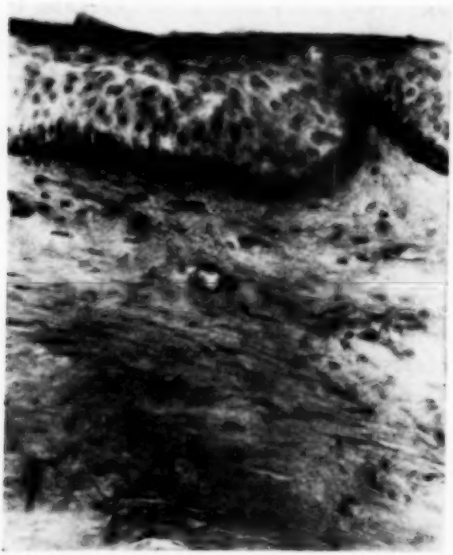

Fig. 3 (Teng and Katzin). Human Eye. Section of cornea at limbus. Note irregularity of thickness and contour.

gray with Weigert; (2) pseudopodlike processes which extended out from this layer between the basal cells of the epithelium.

Loewenstein himself described three cases. The layer was structureless, hyaline in nature, pinkish staining, and acidophil. He thought that Bowman's membrane separated into two differently reacting tissues. He tried many stains to differentiate them, most of which were unsatisfactory.

In 1949, Busacca and Redslob[6] demonstrated the basal membrane of the corneal epithelium, and gave it its name. He used Mallory stain and showed that this membrane of the corneal epithelium stained like other epithelial basement membranes, in contrast to Bowman's membrane, which stains like collagenous tissue. He described it in three cases, namely, keratitis bullosa, pterygium, and pannus.

Redslob,[7] in 1949, showed that this basal membrane is reproduced when destroyed, like the epithelium of the cornea.

In 1951, Vidal[8] described three areas in the basal membrane of the corneal epithelium, anterior, medium, and posterior:

"This medium area is composed of glucoproteins, which are very firm, not very soluble, depolymerizable by mucinase. They are nonsulfurate glucoproteins. The anterior and posterior areas are composed of strands of reticulin (scleroproteins). The basal line is thinner and smoother in the center than at the periphery."

In 1951, Sebruyns[9] used the electron microscope to study the cornea, and gave the following report:

"The print of the cells of the basal layer gives the appearance of a substance more or less homogeneous and is completely full of round or oval vacuoles of different sizes, presenting a spongioid appearance. The ultrastructure of these cells is now, however, from every point of view identical with that which we have found in renal and hepatic cells. It is notably more fine and the vacuoles achieve a certain orientation, which can be observed as more or less horizontal vacuole trails."

Whether any of the descriptions just quoted describes the basement membrane we are not quite sure.

Fig. 4 (Teng and Katzin). Human eye. The granular appearance of the basal membrane is easily made out in this case.

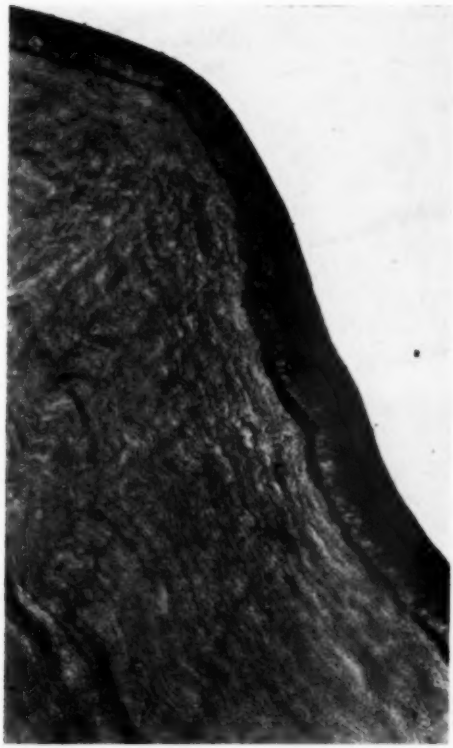

Fig. 5 (Teng and Katzin). Beef eye. Section taken obliquely through the cornea. Note the granular appearance of the basement membrane.

Methods and Materials

Our methods have been those of routine histologic procedure with several modifications. The periodic-acid-fuchsin stain was used, as mentioned. Some of the sections were cut obliquely, and some flat-section preparations were used. Most eyes were normal human eyes, obtained from The Eye Bank for Sight Restoration. However, diseased corneal tissue removed at operations was also studied, as were eyes from cat, rabbit, monkey, and steer.

Findings

The basement membrane of the corneal epithelium (figs. 1, 2, and 3) is found between the epithelial layer and Bowman's membrane. It is continuous and extends to the limbus and beyond it to the bulbar conjunctiva. Anteriorly, it follows closely the curve of the posterior surface of the basal layers of the epithelium. Posteriorly, it rests directly on Bowman's membrane. It is quite smooth until the termination of Bowman's, where greater irregularity is made out.

The thickness of the basement membrane varies considerably. It varies with the individual and with pathologic changes. It ranges in thickness from the width of an epithelial-cell membrane to one third the thickness of Bowman's membrane.

It is usually more easily discernible at the limbal region. Here the stain contrast with subepithelial tissue is greatest, and the membrane is of greater thickness than it is in the conjunctival regions. The membrane has been demonstrated in specimens of all ages from newborn to aged.

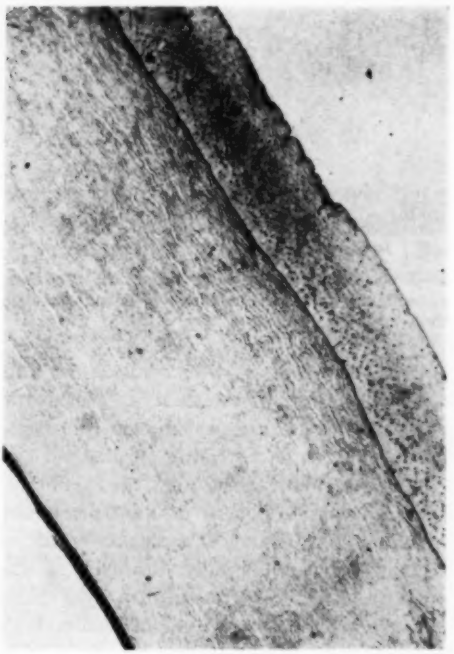

Fig. 6 (Teng and Katzin). Beef eye. The basement membrane is thin, but discernible. Note the absence of Bowman's membrane.

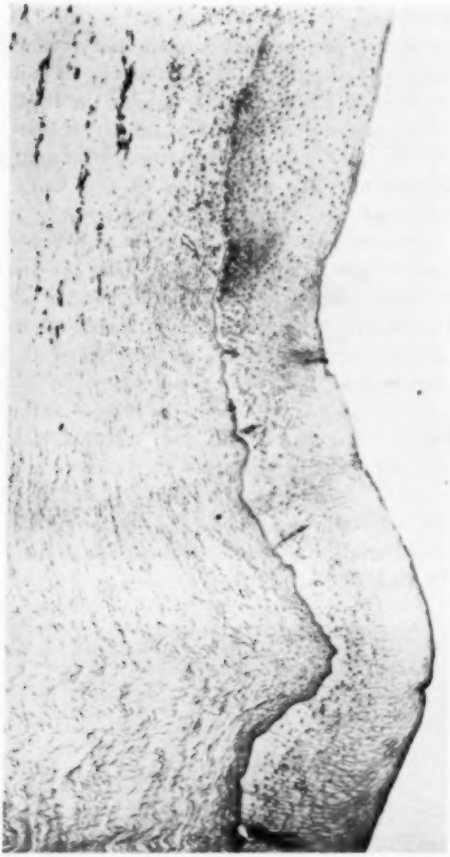

Fig. 7 (Teng and Katzin). Beef eye. Sectioned at the limbus. The basement membrane continues through the limbal region into the bulbar conjunctiva.

It is eosin-staining with hematoxylin and eosin, takes the same stain as Bowman's membrane. With the periodic-fuchsin stain, however, it stains a striking purple.

Under higher magnification, the membrane often appears to consist of fine amorphous granules (figs. 4 and 5) with occasional irregular vacuoles. Usually, however, it appears in the form of a uniform hyalinelike membrane. The anterior surface under high magnification may be rough like fine sandpaper, or may be serrated as it follows the basal layer of the epithelium.

In animal eyes, the membrane has been demonstrated in the cornea of the steer, cat, rabbit, and monkey (figs. 5 and 9).

In beef eyes, the membrane is fairly uniform, easy to see, comparable to human eyes.

In the cat and rabbit, visualization of the membrane is more difficult. In these animals, Bowman's membrane is practically nonexistent, and the stroma adjoining the epithelium has staining characteristics similar to the basement membrane. However, preservation of these eyes in a moist chamber in the refrigerator at 2° to 4°C. allows cer-

Fig. 8 (Teng and Katzin). Cat's eye. The basement membrane is well stained. No Bowman's membrane is present. This eye was allowed to autolyze four days.

Fig. 9 (Teng and Katzin). Rabbit"s eye. The basement membrane is very thin but can definitely be seen. Autolysis was allowed for four days prior to sectioning.

tain autolytic changes to occur, and the stroma loses its property of taking periodic-fuchsin stain. Then the basement membrane of the epithelium can be easily demonstrated, even though it is very thin.

In the monkey, the basement membrane is extremely thin. It can definitely be demonstrated but we are unable to get satisfactory photographs. Since Bowman's membrane is so rudimentary in these animals, the physiologic role of the basement membrane is correspondingly enhanced.

Comment and Discussion

Further investigation in four directions of the properties of the basement membrane are anticipated:

1. *Anatomy.* Further studies on human and animal eyes to improve our knowledge of the morphology of this membrane.

2. *Histochemistry.* The use of various dyes better to understand the nature of this membrane. Osmic-acid tests suggest that fat dyes may shed some light. Nile blue-sulfate and Sudan IV stains are being studied. There appears to be more fat content in the basement membrane than in the epithelium. Histochemical methods for detection of glucoproteins are sought.

3. *Pathology.* All the corneal discs removed at corneal transplant operations are being used for study. We already have some interesting findings.

4. *Physiology.* This subject is undoubtedly the one that merits greatest consideration. Since the physiology of the cornea is so complex, and this tissue lends itself so readily to physiologic studies, the field is as enormous as it is interesting. Bowman's membrane has been referred to as the diffusing membrane of the cornea. Since in many animals it is virtually nonexistent, the basal membrane must be responsible for many of the physiologic properties of the cornea.

Turgescence, studied by Cogan, Kinsey, and others,[10] is dependent upon the permeability characteristics of the corneal membranes. Ionic diffusion, also studied by these authors, is in the same category of properties.

The partition of drugs and other chemicals studied by Swan and his group[11] should be worked out with reference to the basal membrane.

Bullous keratitis, both experimental (Cogan and Kinsey[12]) and clinical, is a condition directly dependent upon the properties of the basal membrane. The adhesive forces between corneal epithelium and Bowman's membrane, studied by Hermann and Hickman,[13] as well as cell cohesion studied by Buschke,[14] are further avenues of investigation.

Karl Meyer's[15] report of analyses of the mucopolysaccharide acid content of the cor-

nea suggests another possible route by which to study this membrane.

Summary

The basement membrane of the corneal epithelium, an anatomic finding, is presented and described. The reports of other authors which bear out our findings are included.

The importance of the basement membrane in various normal and abnormal corneal states is stressed and suggestions are offered for projected studies on this membrane.

210 East 64th Street (21).

We wish to express our appreciation to Miss Ruth Bach, Miss Theresa Fennessey, R.N., and Mr. Anthony LaTessa, B.S., for their technical assistance and to Mr. Eugene Osteroff for the photographs.

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Ophthalmic Miniature

12 Then Tobias taking the gall of the fish anointed his father's eyes.

13 And he stayed about a half an hour and a white skin began to come out of his eyes, like the skin of an egg.

15 And Tobias took hold of it and drew it from his (father's) eyes, and immediately he recovered his sight.

16 And they glorified God, both he and his wife and all that knew him.

Book of Tobias, Chapter 11 (Douai Version), About 705 B.C.

ETIOLOGY OF NARROW-ANGLE GLAUCOMA

Report of a case of glaucoma secondary to anterior displacement of the lens-iris diaphragm

Otto Barkan, M.D.
San Francisco, California

In the present article, a case of secondary glaucoma is reported which affords suggestive and confirmatory evidence of the mechanical principles involved in the development of ocular hypertension in the narrow-angle (iris-block) type of primary glaucoma.

It supplies evidence in support of the theory advocated by Curran,[1] Baenziger,[2] by me and others, that impediment of passage of fluid through the pupil is a factor in the etiology of many cases of chronic primary glaucoma, as well as of the acute attack.

I have suggested in previous articles, on the basis of clinical and gonioscopic observations, that an impediment of flow through the pupil (increased functional or relative pupillary block) plays a role in the course of development of primary narrow-angle (iris-block) glaucoma.[3, 9, 10]

Further evidence in favor of this thesis is the experimental production of glaucoma of the iris-block type as the result of increasing the physiologic seclusion of the pupil by placing a bubble of air over it.[4] This principle is also illustrated by glaucoma in aphakic eyes secondary to a purely physical block of the pupil by a vitreous plug in the absence of anatomic adhesions, and by the cases in which a thinned membranous portion of the iris bulged or retracted according to the pressure differential in front of and behind the iris as described by Ulbrich,[5] Heine,[6] and Urbanek.[7] *

In the case to be described, one small posterior synechia was present which could not possibly have been a causal factor, the rest of the pupil being freely mobile. The course of events to be described shows how increased physical contact between iris and lens, the result in the present instance of anterior displacement of the lens, can produce increased functional seclusion of the pupil and obstruct passage of fluid through it sufficiently to produce forward displacement or "ballooning" of the iris diaphragm (bombé). The resulting obstruction of the filtration angle by the root of the iris produces an increase in intraocular pressure.

Case history

Miss C. P., aged 17 years, was first seen on October 6, 1930, with a convergent strabismus of the right eye which followed a perforating injury with scissors when she was seven years of age.

There was a small circular scar in the center of the cornea. From this a fibrous cord extended across the anterior chamber to the anterior surface of the lens to which it was attached. At the point of attachment there was a partial pyramidal cataract.

The chamber was shallow, especially in the temporal region. The pupil was freely mobile except at the 2-o'clock position, where it touched the cord and where there was a single small posterior adhesion.

Tension was: R.E., 42 mm. Hg; L.E., 32 mm. Hg (McLean). Vision was: R.E., hand movements; L.E., 0.8. On February 15, 1934, the right eye was straightened by operation.

The patient was not seen again until June 25, 1941, 11 years later when she complained of having had three or four attacks of aching over the right forehead and cheek during the preceding six months. Tension was: R.E., 80 mm. Hg; L.E., 30 mm. Hg (McLean). The pupil of the right eye was four mm. in

* Since the completion of this paper, an article by Chandler[11] has been published which reviews and contributes to the subject of narrow-angle glaucoma and pupillary block.

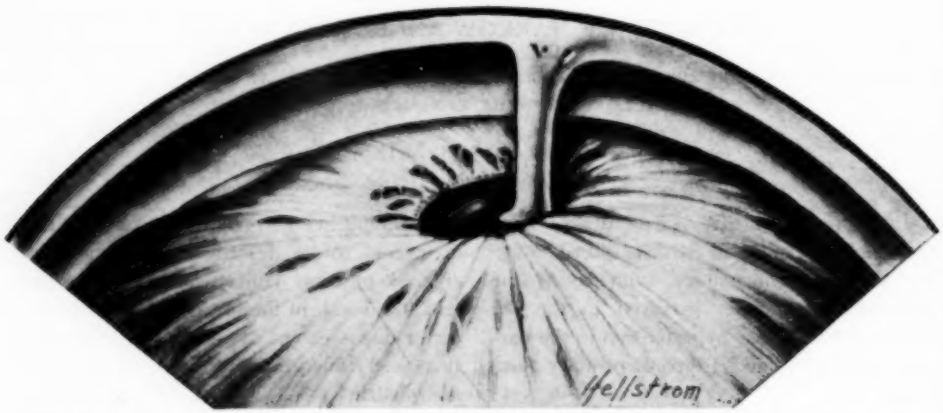

Fig. 1 (Otto Barkan). Drawing shows preoperative microgonioscopic appearance. A fibrous cord pulls the lens forward. The axial anterior chamber is shallow, the iris is bombé, the angle is narrow and partially closed.

diameter; the eye was pale. Miotics failed to reduce the pressure more than a few points.

On inspection, the anterior chamber was much shallower than that of the fellow eye. In the right eye, the chamber depth measured 1.4 mm. with the Ulbrich drum in the nasal portion of the sphincteric region (toward the 2-o'clock position) in that sector which corresponded to the point at which the sphincter hugged the fibrous cord.* In the left eye, the anterior chamber depth, measured at corresponding points of an equal-sized pupil, was 2.4 mm.

The latter is within normal range according to the method of measuring from the anterior surface of the vertex of the cornea to the border of the pupil (two mm. wide) with the Ulbrich drum and the high power of the microscope (magnification ×45).

Gonioscopy of the right eye (with corneal microscope, hand slitlamp, and patient in the supine position) showed the angle to be closed throughout its circumference with the exception of occasional very small rifts between the iris and the anterior border ring of Schwalbe (fig. 1). The sphincter of the pupil touched the cord on its nasal side. The following notes were made at this time:

"The causal factor of the hypertension appears to be a fibrous cord which stretches from the cornea to the anterior surface of the lens and which, through traction, has displaced the lens forward. As a result, the sphincteric region of the iris appears in very close contact in its entire extent with the anterior surface of the lens; whereas, the midperipheral to peripheral region of the iris appears convex or bombé.

"It appears that due to the anterior displacement of the lens and the resultant increased contact or hugging of the lens by the sphincteric portion of the iris, an increase in the physiologic seclusion of the pupil has taken place. This appears to have resulted in accumulation of fluid behind the iris pushing it forward in those peripheral parts in which it is thinnest, thereby narrowing and closing the angle.

"If this interpretation is correct, then peripheral iridectomy should produce collapse of the bombé of the iris diaphragm and opening of the angle, unless the closure of the angle is due to permanent organic adhesions. I do not expect to find adhesions,

* In the present article, only the direct uncorrected readings of the Ulbrich drum are given. They represent the apparent depth of the anterior chamber and are used only for purposes of comparison.

however, but believe the closure of the angle is due to purely physical apposition of the iris to the wall of the angle, since there has been complete absence of congestion throughout the development of the hypertension."

It is interesting to note in connection with the foregoing that, in a series of over 200 narrow-angle (iris-block) glaucomas,* I have found that extensive permanent peripheral adhesions formed only as the result of congestive episodes. They are not found, except to a limited extent, in an eye which has always been in the noncongestive phase even though the pressure was high, as it was in the present case. This fact has been recently emphasized by Kronfeld, Sugar, Chandler, and others.

Operation

It was my intention, following deepening of the chamber,[8] to perform a peripheral iridectomy. Therefore, on July 7, 1941, the right eye was operated. One-eighth cc. of vitreous was aspirated with a No. 7 Zur Nedden needle.† Through an oblique water-tight puncture incision made with a Graefe knife, 1.5 mm. axial to the corneoscleral margin in the horizontal meridian, the anterior chamber was deepened by injecting physiologic saline solution with a No. 29-gauge needle.

While the chamber was being deepened, the cornea was seen to dimple as a result of a backward pull of the fibrous cord by which it was attached to the lens. For this reason it was decided to sever the cord.

A keratome incision was made in the 12-o'clock meridian one mm. scleral to the corneoscleral margin and with a marked bevel in order to render the incision water-tight or self-sealing. The fibrous cord was severed with Barraquer iridectomy scissors.

With the cornea and lens released from their mutual connection, the chamber was easily deepened by injecting saline solution through the previously made puncture and without any resultant dimpling of the cornea. An iridectomy was not done since the chamber promised to remain permanently of normal depth and the angle open. Eserine was instilled and a binocular bandage applied.

Convalescence was smooth. The anterior chamber remained of normal depth, the angle free, and the cornea brilliant. On the fourth

* To be published.

† I no longer find aspiration of vitreous indicated as a preliminary procedure.

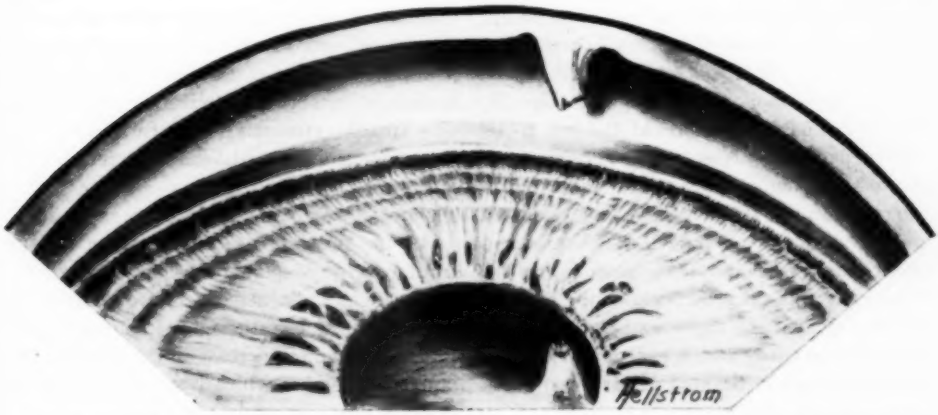

Fig. 2 (Otto Barkan). Drawing shows postoperative microgonioscopic appearance. The fibrous cord has been severed. The axial anterior chamber depth is normal, the angle is wide and open. There are some patches of pigment on the angle wall which are the residues of previous contact and closure of the angle by the root of the iris.

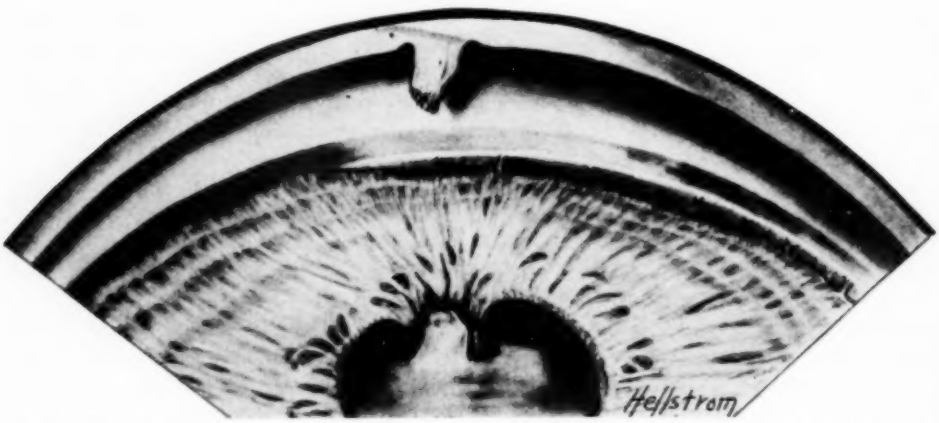

Fig. 3 (Otto Barkan). Same as Figure 2 viewed from a different direction, showing the single small posterior synechia adjacent to the attachment of the cord to the anterior surface of the lens.

day it was noted that the pupil was 3.5-mm. wide and reacted freely to light throughout its circumference except at the one point, at the 2-o'clock position, where it was attached to the stump of the cord.

In the course of the next several months examination showed freedom of movement of the pupil and absence of posterior adhesions except at the aforementioned point of the stump of the fibrous cord. The pupil dilated freely to mydriatics except at this one point. The peripheral portion of the lens was clear. The fundus could not be seen in detail. The tension was normal: R.E., 32 mm. Hg; L.E., 28 mm. Hg (McLean).

Postoperative gonioscopy on October 24, 1941, showed the surface of the iris to be rather flat in contrast to the preoperative convex or bombé appearance. The circular furrows of the iris which had been absent preoperatively, when the iris was bombé and stretched (figs. 2 and 3), were now present. The angle was open throughout the circumference so that the angle wall could be seen in almost its entire width, except at one point, at the 2-o'clock position at which a peripheral adhesion was present.

In the upper circumference between the 11- and 1-o'clock positions, the entrance to the angle was still very narrow. Between the 1- and 2-o'clock positions, corresponding to the sector of the fibrous cord the angle wall was stained golden brown by pigment which had been left there as a result of previous contact with the iris. The remaining angle wall had a slightly stained appearance as if from previous contact with the dark-brown iris.

On February 8, 1950, nine years after the operation, the tension was: R.E., 31 mm. Hg; L.E., 28 mm. Hg (McLean). The depth of the anterior chamber measured with the Ulbrich drum was: R.E., 2.5 mm.; L.E., 2.5 mm. Gonioscopy was repeated and showed the same findings as described in the examination of October 24, 1941. The plane of the iris and the circumferential furrows of the iris were similar to those in the fellow eye.

Discussion

In the present case severing the fibrous cord which had pulled the lens forward resulted in permanent reduction of tension to normal. The lens returned to its normal position as shown by increase in the depth of the anterior chamber which was equal to that of the left eye. The angle was opened.

The most likely explanation for the course of events appears to be that relief of the anterior displacement and return to the nor-

mal position resulted in restoring the physiologic rate of flow through the pupil by relieving the increased seclusion and, consequently, relieving the bombé and opening the filtration angle, thus reversing the vicious circle which was producing the hypertension.

In intraocular hypertension due to seclusion of the pupil in iritis, the course of events is similar except that the interruption of flow through the pupil is due to organic obstruction which does not become effective until the seclusion is complete. It is relieved by short circuiting the obstruction by transfixion of the iris (iridotomy) or by iridectomy.

Since there was only one small adhesion present between iris and lens in the present case, the seclusion could not have been due to it but must have been of functional origin due only to the increased physical contact between iris and lens.

When normal conditions were restored by severance of the fibrous cord, it was no longer necessary to make a short circuit through the iris in order to restore free flow through the iris lens diaphragm. Therefore, iridectomy or iridotomy was unnecessary.

It might be claimed with some appearance of justice that it is not necessary to assume an increased seclusion of the pupil in this case, but that the angle became narrowed and closed due to simple anterior displacement of the lens iris diaphragm as in the case of glaucoma secondary to anterior adhesions of the iris. But, the following would argue against such a claim:

1. There was an exaggerated contact of the whole sphincteric portion of the iris to the lens.

2. On gonioscopy there was a definite convex shape of the peripheral portion of the iris (bombé) in a region in which the iris is known to be no longer in contact with the lens.

3. In cases of leukoma adherens and glaucoma secondary to it, the iris proceeds in a straight line to the angle.

4. The convex shape of the iris disappeared as a result of the operation.

Anterior synechia of the lens and pyramidal cataract following perforation of the cornea in early childhood generally produces glaucoma.[12] The cause has been considered to be (1) peripheral adhesion following the almost complete absence of the anterior chamber and (2) irritation of the ciliary body due to pull on the zonular fibers.

The attempt may be made to reduce the pressure by carefully severing the synechia.[13] I have found no mention in the literature of the causal factors or the explanation offered in the present article. I believe that the relief of pressure obtained by means of severing the anterior adhesion in this type of case can be accounted for only through this explanation.

Analogy to primary glaucoma of the narrow-angle (iris-block) type

An analogy may be drawn between this case of secondary glaucoma of known origin and primary glaucoma of the narrow-angle (iris block) type in which the anterior chamber is shallow due to anterior displacement of the lens-iris diaphragm. In primary glaucoma of the iris-block type, peripheral iridectomy performed through a self-sealing incision[9] can be shown to reduce the pressure by short circuiting the seclusion of the pupil, collapsing the relative bombé, and opening the angle.[3] Such an action probably explains the effectiveness of Curran's iridotomy in cases in which, as he stated, "the iris hugged the lens." By making an aperture in the iris, the vicious circle of relatively increased seclusion, iris bombé, closure of the angle, and retention is broken.

As will be shown in another article, adequate peripheral iridectomy performed through a self-sealing incision in primary narow-angle glaucoma sometimes results in the lens regaining its normal position by posterior recession, rapid in some cases and more gradual in others. Thus it appears that in many cases of primary narrow-angle glaucoma, the increase of pressure is due to a

relatively increased seclusion of the pupil (pupillary block).

It would seem from the case of secondary glaucoma reported in this article and from clinical observations in primary iris-block (narrow-angle) glaucoma, that the anterior position of the lens can be both causative of the seclusion and secondary to it, thus constituting a vicious circle.

Summary

In the case of secondary narrow-angle glaucoma described in this article, the pressure-producing seclusion was caused by anterior displacement of the lens and was relieved without resorting to iridectomy. The lens receded posteriorly after the fibrous cord which was maintaining it in an anterior position was severed. Thus, the seclusion and bombé were relieved by posterior displacement of the lens. When the lens was permitted to recede to its normal position, physiologic conditions were restored and the tension was permanently normalized.

An analogy is drawn between this case of secondary glaucoma of known origin and primary glaucoma of the narrow-angle (iris block) type in which anterior displacement of the lens-iris diaphragm and increased seclusion of the pupil (relative pupillary block) appear to be important pathogenic factors.

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Ophthalmic Miniature

I called this morning to see Will. Congreve, who lives much by himself, is forced to read for amusement, and cannot do it without a magnifying glass.

Swift, *Journal to Stella,* July 1, 1711.

THE SURGICAL TREATMENT OF GLAUCOMA COMPLICATING CONGENITAL ANIRIDIA*

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It is not the intention of this presentation to discuss in detail the embryology, histology, or genetics of congenital aniridia or irideremia. These phases of the subject have been ably and recently covered by Callahan[1] and Pincus.[2] Congenital lack of the iris is always represented by a narrow rim of tissue, is always bilateral, and results from defects in the development of the mesodermal and epidermal layers of the iris. It shows a marked tendency to hereditary transmission and occurs usually as a dominant characteristic. Aniridia is generally complicated by other structural defects of the eye, such as cataract, ectopia lentis, nystagmus, corneal opacities, aplasia of the macula, and especially by glaucoma.

It is impossible to determine exactly how frequently congenital aniridia occurs, perhaps in 0.04 percent of cases. Judging, however, from the small number of cases seen by clinicians of wide experience, the disease is comparatively rare. What proportion of these patients develop glaucoma is even more difficult to determine, but it is certainly a fairly frequent complication of an already unpleasant picture. According to E. Treacher Collins:[3]

> Regarding cases of aniridia from the clinical standpoint alone, we should be inclined to think that it was impossible for them to become subjects of glaucoma; for we fail to see how, when the iris is absent, the filtration area can be blocked. But the microscope seems to show that they are really predisposed to glaucoma, because between the rudimentary iris and the ligamentum pectinatum there are abnormal adhesions. This is so in the eyes examined by Pagenstecker and Rindfleisch and in those that I have recorded.

It would appear that the increased intraocular pressure is not present at birth or one would find enlargement of the globe comparatively early in life. As a matter of fact, buphthalmos is rarely seen. Therefore there must be a building up of pressure for a considerable time before we observe the evidences of glaucoma.

The treatment of congenital aniridia with glaucoma presents a difficult and unsatisfactory problem. Belmont[4] quotes Professor Ernst Fuchs who once said that all of these cases are hopeless. While several writers have reported lowering of the intraocular pressure through the use of miotics, the majority have failed to obtain any lasting benefit from these drugs. When reduction of tension does occur, it is probably due to the pull upon the scleral spur or to the effect upon the blood vessels of the uveal tract. In view of the generally unsatisfactory results of miotic medication alone, surgery is usually indicated when the tension becomes definitely elevated. It may be that a combination of miotics and surgery will yield better results.

Many textbooks on ophthalmology dismiss the subject of aniridia with a few scant words and little or no recommendation as to treatment. Because my surgical experience in congenital aniridia complicated by glaucoma is limited to a single patient and because of the diverse opinions expressed by the relatively small number of reports available, it was thought desirable to solicit a sufficiently large number of surgeons, requesting information as to their experience in operations upon these patients.

The results of this inquiry requested of some 87 ophthalmologists, mostly members of this society, revealed several significant facts. In some instances, the replies were difficult to tabulate—for instance, the surgeon would reply that he had performed cyclodialysis two or three times on one eye and

* Presented at the 88th annual meeting of the American Ophthalmological Society, Hot Springs, Virginia, June, 1952.

then had done diathermy, or a sclerectomy combined with cyclodialysis, and so forth.

In assembling the facts here presented, I have endeavored to make clear the procedure which seemed to have yielded the results tabulated. A considerable number of the surgeons replied that they have had no experience in the surgery of glaucoma complicating congenital aniridia but expressed their opinion as to what procedure would be followed if confronted with the problem. These replies seem to me to be of very great value in the consideration of treatment, since no one person admits a large experience with this rare condition.

The results of the questionnaire are tabulated below.

RESPONSE TO QUESTIONNAIRE

Number of replies received	87
Number of replies, "No experience"	46
Number of surgeons having operated upon aniridia	41

TYPES OF OPERATION AND RESULTS

	Controlled	*Not Controlled*
Trephine	4	10
Cyclodialysis	13	15
Cyclodiathermy	8	8
Sclerectomy	5	1
Goniotomy	11	1
Extraction of cataract	1	

PREFERENCES EXPRESSED AS TO TYPE OF SURGERY, IF REQUIRED

Trephine	2
Cyclodialysis	6
Cyclodiathermy	10
Goniotomy or goniopuncture	5

In spite of the small number of cases of glaucoma operated upon, and in view of the suggestions for treatment when and if surgery were required, it would appear that cyclodiathermy, or cycloelectrolysis, is to be preferred. In the small series of sclerectomies, possibly with excision of the iris root, this procedure with five good results against one failure is significant.

Certainly cyclodiathermy is becoming an increasingly popular operation and modifications in technique are making for better results. Placing the diathermy points farther back of the limbus, together with a longer period of contact with the applicator, are yielding better reduction of tension. Possibly Weve's method of attempting to destroy the ciliary nerves still more posteriorly will present advantages.

An analysis of these rather scanty figures shows, first of all, that the surgical experience in the treatment of glaucoma complicating congenital aniridia is not extensive. No one operator has seen or treated a sufficient number of cases to have a convincing opinion as to the best method. Secondly, the tabulation shows that nearly half of the cases were unsuccessful, whatever method was employed. It is to be hoped that all surgeons who operate for this type of glaucoma will report their results with the method used. Only in this way shall we acquire enough information to guide physicians in making a decision as to the best procedure to follow.

CASE REPORT

I wish to describe the single case upon which I have operated for glaucoma complicating congenital aniridia, and the result of treatment.

The patient was a boy aged seven weeks when first seen on May 8, 1931. He was the second offspring of healthy parents who suffered from no ocular pathology of any kind. The first-born child was a boy whom I saw at the age of six months. He was afflicted with congenital aniridia and died at the age of three years from influenza. The aniridia was not a complete ring, there being a narrow rim of iris, shaped like a horseshoe and open at the top. Three other children were born to these parents after the second child and none of them has developed any eye disease.

The patient, the second sibling, presented the picture of bilateral congenital aniridia. There were posterior polar cataracts in each eye with the surrounding lens substance transparent. No nystagmus was observed.

Six months later the child followed lights and objects and the cataracts were unchanged. The fundi appeared to be normal.

At five years of age the corrected vision was 15/200 in each eye. The patient moved to another state and was not seen by me until he was 16 years old, when vision was found to be 20/140 with the correction of high myopia. The intraocular pressure was 55 mm. Hg in each eye (Schiøtz) and the field was limited to a small central area. The right eye was exotropic.

In view of the lens changes and the increased tension, it was decided to extract the right cataract. Because of marked nervousness and nystagmus, the anesthetic chosen was sodium pentothal. Following the removal of the lens in capsule, the boy was extremely excited and required three people to hold him in bed. A choroidal hemorrhage resulted, leading eventually to a shrunken globe. Various miotics, including "floropryl," were used in the attempt to reduce tension in the remaining eye, but with no effect.

Therefore, on November 8, 1947, cyclodiathermy was performed. Two subsequent diathermies were done, resulting each time in a lowered intraocular pressure. A fourth procedure, cyclo-electrolysis, was done below, resulting in tension of 19 mm. Hg which persisted for three years. When seen May 24, 1952, the tension was 30 mm. Hg.

The patient is now a junior in college, doing his work with the aid of a reader. In this case, cyclodiathermy, plus miotics, has proved to be a safe procedure and one which gave a fairly satisfactory reduction of tension.

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ON THE PROBLEM OF AN INTERNATIONAL NOMENCLATURE FOR DESIGNATING VISUAL ACUITY

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Rochester, Minnesota

The Committee on Optotypes of the International Council of Ophthalmology has been interested in the adoption of a decimal system to designate visual acuity that would be standard for international use. Dr. Conrad Berens, a member of that committee, asked that an expression of opinion on that problem be obtained from the American Committee on Optics and Visual Physiology before a decision is made and before final recommendations are made to the International Federation of Ophthalmological Societies.

Accordingly at the meeting of the American Committee in October 1951, a special subcommittee* was appointed to explore the possibilities of working out "the geometrical and decimal systems together in a practical manner."

This paper is the report of that subcommittee, and is being published at the request of the parent committee. The discussion of the problem and the recommendations by the

* Chairman of the subcommittee consisting of the following members: Col. Victor Byrnes, Randolph Field, Texas; Alfred Cowan, M.D., Philadelphia, Pennsylvania; Lieut. Cmdr. Dean Farnsworth, U. S. Submarine Base, New London, Connecticut; Gerald Fonda, M.D., Milburn, New Jersey; W. B. Lancaster, M.D., Boston, Massachusetts; James E. Lebensohn, M.D., Chicago, Illinois; Louise Sloan, Ph.D., Wilmer Institute, Baltimore, Maryland.

members of this subcommittee have been made entirely by correspondence.

Introduction

At the outset it was not exactly clear what was expected of this committee since the charge to it was "to work out the geometrical and decimal systems together in a practical manner." Dr. Lancaster[1] wrote then: ". . . all that [would be] needed is to label the charts with both d/D numbers and the same values reduced to decimals by dividing d by D.† . . . Such a simple matter can hardly be the purpose of the delegation of the International Federation of Ophthalmological Societies. A possible interpretation is: to select a series of sizes of letters or characters to be recommended for the chart manufacturers, these to be labeled both ways."

More to the point, it appeared that the task of the committee was to obtain a majority point of view regarding a proposal to standardize (1) a particular mode of designating visual acuity and (2) a particular gradation of steps in letter size for the visual acuity charts. These two problems are interdependent. Moreover, a number of fundamental problems are involved in these. Before making recommendations for the adoption of a particular notation or gradation for visual acuity charts for international usage, these problems should be stated and in so far as possible studied. Essentially this is what the committee has done, and perhaps it may have gone farther into the general problem than was necessary for the immediate purposes.

Many ophthalmologists have insisted that the visual acuity test charts are primarily for clinical use (1) to determine the effect of certain ocular diseases on visual acuity and (2) especially to assist in the determination of the refractive correction for patients. The visual acuity itself is then not important until the final refractive correction is approached in the refraction examination. The exact manner in which the letters of successive lines of the chart decrease in size would for this purpose be relatively less important.

The majority of the members of this committee, however, felt that the design of test charts should be such that reasonably accurate determinations of visual acuity itself could be made. Certainly the fundamental basis for the design of such charts or for the designation of visual acuity in any international standardization should not handicap the research worker or those who must select personnel on the basis of visual acuity (such as may be necessary for industry or for the armed forces).

A uniform decimal scale or fractional designation of visual acuity requires some type of uniform gradation in the sizes of the letters of successive lines of the test chart. There seems to be almost universal agreement that this gradation should approach that of a geometric progression, that is, a gradation in which the size of the letters of one line bears a constant ratio to the size of the letters in the preceding (or succeeding) line of the chart.

As stated by Lancaster: "the series of letter sizes on the chart (as shown long ago by Ewing and Green . . .)[2] should be so chosen that the jump from one line to the next smaller is always the same (20%) and hence from one line to the next larger is always 25%. Experience has shown the Ewing-Green plan is not only sound but eminently useful."

Such a method of preparing a visual acuity chart gives sizes of test letters of successive lines on the chart which increase in a geometric progression. Instead of making all the letters on a given line of the chart the same size, it may be desirable to design the test chart so that successive letters increase in size. Again the gradation in size of successive letters should be in geometric progression.

The following questions are then pertinent:

1. Are there any theoretical or experi-

† Actually the decimal designation should be defined as the reciprocal of the visual angle (of resolution) expressed in minutes of arc.

mental bases for making the sizes of the letters of the visual acuity chart increase in a geometric progression?

2. If so, what should be the rate of the geometric progression?

3. It would then follow: What should the designation of these steps be for a simple and practical scale for designating visual acuity that could be used internationally?

Geometric gradations

To say that the gradation of sizes of the letters of successive lines of the visual acuity test chart increases in a geometric progression means that there is a logarithmic relationship between them. More explicitly, if A is the visual angle (minutes of arc) subtended at the eye by the letters of a given line on the chart, and if we specify the number of this line or step in the chart by S, then

$$A = R^S \qquad (1)$$

In this, R is a constant and is the ratio of the size of the letters of one step to that of the letters of the preceding line. This follows, for if A_1 is the size of the letters of line number S, and A_2 is that for the next higher line on the chart, number $(S + 1)$, then the ratio

$$\frac{A_2}{A_1} = \frac{R^{(S+1)}}{R^S} = R \qquad (2)$$

It follows then from (1) that

$$\log A = S\,[\log R].$$

This means that if the logarithms of the visual angles of the letters of successive lines of the test chart are plotted against the step numbers of the lines a straight line graph is obtained, the slope of which is log R.

Thus in Figure 1 there are illustrated the scales proposed by Green[2] (1867) for which $R = \sqrt[5]{2} = 1.26$ (the size of letters of each successive line being 26 percent larger than that of the preceding line, or 20 percent smaller than that of the following line); Javal[3] (1878) and Blaskovics[4] (1923), for which $R = \sqrt{2} = 1.41$, and that used for experimental purposes during the last war by the A.G.O. for which $R = \sqrt[4]{2} = 1.189$.

The gradation in test lines of many currently used charts does not conform to a geometric scale. For example, in Figure 2 are shown the scales used in the Project-O-Chart

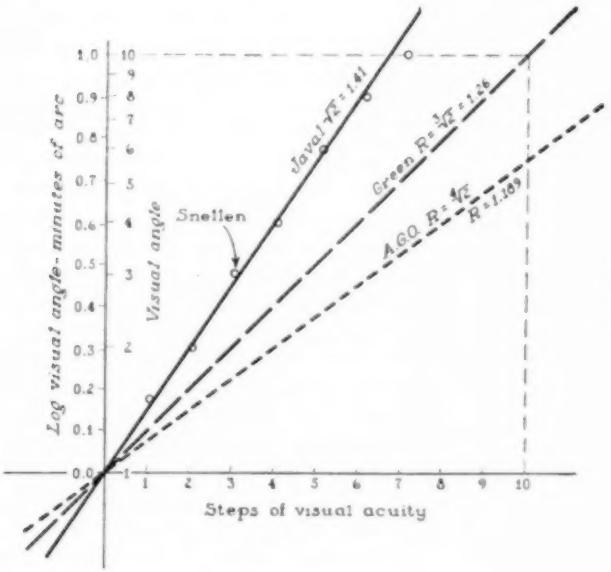

Fig. 1 (Ogle). A strict geometric progression of the sizes of the letters of successive lines of the visual acuity chart provided by four available charts.

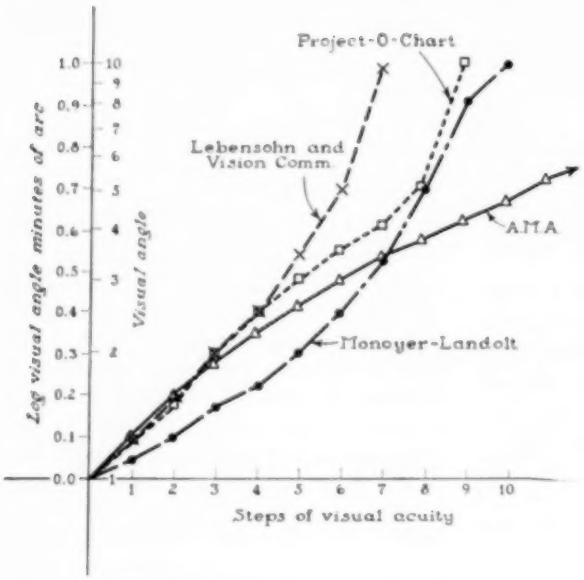

Fig. 2 (Ogle). Illustration of the fact that several of the currently available charts do not provide strict geometric progression in the sizes of the letters of successive lines of the visual acuity chart.

(American Optical Company), American Medical Association test chart of visual efficiency, the Vision Committee new Armed Forces chart, and the Monoyer[5] (1875) decimal scale which Landolt[3] (1887) essentially used.

The higher the value of R, the fewer will be the steps on the chart between the visual angles of 1.0 and 10 minutes of arc (Snellen visual acuity 20/20 to 20/200) and hence the coarser the measurement of visual acuity. The A.G.O. scale has the lowest gradient of all scales so far proposed. This scale permits a finer measurement of visual acuity, which necessitates more steps and hence a larger chart.

Any number of different geometric series could be worked out, all depending upon the particular choice of R. In particular suppose we want a chart with a range of visual angles r (say 1 to 10) for a given chart, and suppose we want n steps within that range; then the ratio R of the size of the letters of any line to that of the preceding line will be $\sqrt[n]{r}$.

Visual acuity designations

The fundamental basis of visual acuity is the minimum separable or the minimum angle of resolution—the ability of the eye to perceive a small interruption of continuity in a test pattern. The threshold of this perception would be the smallest visual angle under which this gap or series of equally sized gaps of the test detail can be discriminated. We need not here go into the matter whether in the use of any test type, factors other than pure resolution are involved.

In the design of characters for testing visual acuity by chart, historical precedence set by Snellen has made the visual angle of 1.0 minute of arc the starting point. If the constituent parts of the test characters (letters, numbers, and so forth) subtend a visual angle of 1.0 minute of arc, and these characters can just be discriminated by the subject, his visual acuity is said to be "normal." While many individuals have better acuity thresholds than 1.0 minute of arc, clinically speaking, if the threshold is no better than 1.0 minute the eye has "defects sufficiently pronounced to be easily established," for example, refractive errors, central scotomas, amblyopia, cloudy media, and so forth.

1. *Fractional form.* If letters (or test

figures), the constituent parts of which subtend a visual angle to the eye of 1.0 minute of arc, can just be discriminated, the vision of that eye is said to be unity, $V = 1$; if that angle is 0.5 minute of arc, its vision is said to be $V = 2$; if the visual angle is 2.0 minutes of arc, the vision is said to be $V = 0.5$. Thus the visual acuity is said to be represented by the number (fraction) which is the reciprocal of the smallest angle of resolution in minutes of arc.

2. *Snellen notation.* The well-known Snellen designation for visual acuity V is the fractional notation $V = d/D$ in which d is the visual distance at which letters of a certain size can just be discriminated (the test distance) and D is the distance at which those particular letters would subtend 1.0 minute of arc. When the Snellen notation is reduced to lowest denominator, it is equivalent to the fractional form given in the preceding paragraph.

A problem in the use of the Snellen notation is: Are we justified in using this notation, for example, 20/30 (or 6/9), to indicate the visual acuity when the test made was conducted at some other observation distance than 20 feet (or six meters)? Should the numerator of the fractional form *always* indicate the visual distance at which the test was conducted, or can we use those fractions merely as *names to identify* a particular visual acuity? Are we really justified in using the same fractions for near (reading) and for distance? Lebensohn,[6, 7] for example, has used the Snellen 20/X equivalent notation on his near vision test charts. Probably most refractionists would say "no" to this last question. But we talk about a 20/30 distant vision acuity, when it may have been measured on a test chart at 12 feet.

A second problem concerns the comparison of visual acuity for near vision with that for distant vision. If the acuity for distance is 20/30, a calculation is necessary to find that this corresponds to 14/21 when inches are used and the visual distance is 14 inches. From the point of view of many refractionists this problem of comparison of distant and near acuity is not so important since the distant and near scales are separate aspects of the refraction problem. However, such comparison may be important, for example in testing malingerers, and checking the adequacy of a given refraction.

3. *Decimal notation.* Since first suggested by Monoyer in 1875, a decimal system has frequently been proposed which would be more readily comprehended by all regardless of the units of length used (feet or meters, inches or centimeters, distant or near vision). The decimal notation is the reciprocal of the visual angle in minutes of arc, and this is also equal to the numerical value of the fraction notation as well as to the Snellen notation. This decimal system is quite generally used internationally and with certain writers it is considered the most suitable system. The objections to the decimal form are:

a. It tends to connote a percentage of vision (and difference from unity as percentage loss of vision), an interpretation which is erroneous.

b. A uniform and simple decimal scale that at the same time permits a geometric progression in the sizes of the letters of successive lines is impossible. That is, one cannot have a geometric gradation and at the same time make 20/20 = 1.0, 20/40 = 0.5 and 20/200 = 0.1. In order to adhere rigorously to a geometric progression in the sizes of the letters of the chart, uneven decimals result.

The value of the decimal notation is that one can easily (mentally) convert to the Snellen notation in either metric or English units. No reference tables are necessary.

4. *Other types of notation.* a. In order to avoid the "percentage of vision" implication of the decimal system, it has been proposed to multiply each decimal notation by 10, so that 20/20 = 10 and 20/200 = 1. Such a system has been employed with the Orthorater.

b. An arbitrary scale of 1 to 10 was suggested by Armaignac[8] in 1906 (table 1).

c. On the basis of an analogy with the

TABLE 1

SCALE SUGGESTED BY ARMAIGNAC[8] IN 1906

Visual Angle (min.)	1.00	1.25	1.60	2.20	3.00	4.00	5.00	6.60	8.20	10.00
Snellen	20/20	20/25	20/32	20/44	20/60	20/80	20/100	20/132	20/164	20/200
Armaignac	10	9	8	7	6	5	4	3	2	1

specification of lens power by diopters, Blaskovics[4] (1923) has suggested special units of visual acuity which he calls "oxyopters" (table 2). Oxyopters are defined as $60 \div$ visual angle in minutes of arc. Thus using a geometric progression in which $R = \sqrt[3]{2}$ we have the values in Table 2.

d. In order to be completely divorced from preconceived concepts about normal visual acuity, a research project conducted during the war under the A.G.O. arbitrarily selected units for a visual acuity scale based upon the formula

$$U = \log_2 2^{10}/A$$

in which A is the visual angle in minutes of arc. This formula gives a geometric progression (called by Farnsworth[9] the "kappa" scale) with $R = 1.18$ and is in part as in Table 3.

e. Colenbrander[10] expressed the belief that the decimal scale exaggerates changes in visual acuity in the range of poorer vision, as compared to changes in the better acuity range. He suggested that to equalize more nearly the steps of the scale and obtain a more "valid" visual acuity, the square root of the decimal form visual acuity should be used (see table 4).

BASES FOR A GEOMETRIC PROGRESSION

Although there appears to be some general agreement that the sizes of the letters of successive lines on the test chart should increase by a geometric ratio, theoretical and experimental bases for such a progression are by no means clear.

1. Lythgoe[11] has published data which give the percentage of correct answers in the discrimination (resolution) of the gap in a series of Landolt rings of varying sizes. If one plots the percentage of correct answers on probit (probability) graph paper against the logarithm of the visual angle of the gap in each case, a consistent straight line is found.

This indicates that the probability of discriminating the gap is proportional to the logarithm of the visual angle, and as such suggests a geometric progression in the sizes of the characters of the test chart. However, these data pertain only to an individual with a given visual acuity.

Data are necessary which show that individuals in two groups whose visual acuities are in entirely different ranges are each normally distributed with respect to a logarithm of the visual angles of the same test chart. While such data may exist, they have not been described in the literature.

Attempts have been made to devise a scale of graduated sizes of test letters which would make the distribution of the visual acuities of the population in general a normal one.

TABLE 2

OXYOPTERS SUGGESTED BY BLASKOVICS[4] IN 1923

Visual Angle	0.6	0.75	1.00	1.25	1.73	2.28	3.00	4.00	5.25	7.00	9.20
Snellen	20/12	20/15	20/20	20/25	20/35	20/45	20/60	20/80	20/100	20/140	20/180
Oxyopters	100	80	60	48	35	26	20	15	11.5	8.5	6.5

TABLE 3

GEOMETRIC PROGRESSION CALLED BY FARNSWORTH[9] THE "KAPPA" SCALE

Visual Angle	0.5	0.6	0.7	0.84	1.0	1.2	1.43
Snellen	20/10	20/12	20/14	20/17	20/20	20/24	20.28
A.G.O.	44	43	42	41	40	39	38
Visual Angle	1.67	2.00	2.40	2.7	3.33	4.0	etc.
Snellen	20/33	20/40	20/48	20/55	20/67	20/80	etc.
A.G.O.	37	36	35	34	33	32	etc.

It was, for example, found by van Beuningen[12] that the frequency of 1,190 observers between the ages of 20 and 35 years, distributed according to visual acuity tested with a letter chart, when plotted against the reciprocal of the visual angles, approximated a normal distribution.

While a logarithmic progression assists in normalizing the curve, there is still too high a proportion of subjects in the 20/15 to 20/20 range. There is no reason to expect that such a normalizing scale can exist because of the anatomic limits (a limiting barrier) to the visual acuity in this region.

2. According to Javal,[13] if the normal eye can resolve letters of a given size at one distance, but another eye can only discriminate the same letters at half the distance, it is illogical to write that the vision of the second eye is only 0.5. Since the angular *area* of the letters has been increased four times, he thought the vision should be written 0.25.

There would be a constant ratio in the areas of letters in successive lines of a test chart designed on this basis, and such a scale would be a geometric gradation. The problem is again what should be the particular rate of progression.

Suppose we begin with the usual 20/20 line or visual angle of 1.0 minute of arc, and make the letters of the next line according to the present 20/25 line (visual angle = 1.25 minute). This procedure, of course, at once specifies the ratio R [equation (1) above],

TABLE 4

SUGGESTED SIMPLIFIED GEOMETRIC PROGRESSION (AFTER GREEN)*

Step	Visual Angle	Snellen		Decimal	"Valid" $\sqrt{\text{Decimal}}$	Modified Valid
		English	Metric			
4a	0.40	20/8	6/2.4	2.5	1.58	1.6
3a	0.50	20/10	6/3	2.0	1.41	1.4
2a	0.63	20/12	6/4	1.6	1.25	1.2
1a	0.80	20/16	6/5	1.25	1.12	1.1
0	1.00	20/20	6/6	1.00	1.00	1.0
1	1.25	20/25	6/7.5	0.8	0.9	0.9
2	1.6	20/32	6/10	0.63	0.8	0.8
3	2.0	20/40	6/12	0.5	0.7	0.7
4	2.5	20/50	6/15	0.4	0.63	0.6
5	3.2	20/64	6/20	0.32	0.56	0.5†
6	4.0	20/80	6/24	0.25	0.50	
7	5.0	20/100	6/30	0.20	0.44	0.4†
8	6.3	20/125	6/38	0.16	0.40	
9	8.0	20/160	6/48	0.12	0.35	0.3†
10	10.0	20/200	6/60	0.10	0.32	

* For which $R = 1.26$.
† These three compromises reduce the number of lines of the test chart by 3.

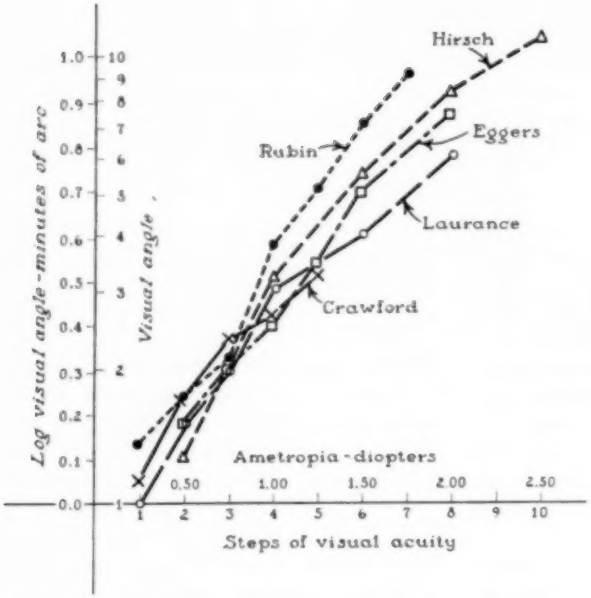

Fig. 3 (Ogle). The relationship between visual acuity and refractive error as indicated by the data of five different studies reported in the literature.

for if a_1 and a_2 are the areas of the letters of successive lines whose visual angles are A_1 and A_2, then according to this scheme

$$\frac{a_2}{a_1} = \frac{A_2^2}{A_1^2} = \frac{1.25^2}{1.00^2} = 1.562$$

but since $R = A_2/A_1$,

$$R = \sqrt{1.562} = 1.25$$

This scale of gradation is of course essentially the same as that of Green and of Ewing ($R = 1.26 = \sqrt[3]{2.}$)

3. *Visual acuity and uncorrected refractive errors.* The data that relate visual acuity with uncorrected ametropia (myopia in particular) as reported in the literature might provide an experimental basis for the rate of progression. Data available so far are considered by some workers not suitable as a basis for a visual acuity scale. However, the data appear to show a trend for both myopia and hyperopia. The data of the following experimenters have been used here:

1. 1920, Laurance[14] (no source of data given)
2. 1945, Eggers[15] (basis 6,000 refractions)
3. 1945, Hirsch[16] (64 myopic students)
4. 1945, Crawford and associates[17] (160 myopes)
5. 1951, Rubin and associates[18] (1,105 simple myopic eyes).

When the logarithm of the visual angles is plotted against the corresponding diopters of myopia, as shown in Figure 3, a linearlike trend is suggested. Only the data of Hirsch fail to show this trend, but his data on only 64 subjects cover a range of myopia 0.5 to 4.0 diopters in 0.5 diopter steps. Rubin and associates dealt with the problem statistically, and perhaps their data are the more important.

In comparing the data of these writers one must keep in mind the differences in the test scales used, in the method of defining the groups according to refractive error and according to the fixed lens steps available, and in the intensities of illumination used, and so forth. The greatest discrepancies in the results of the several studies appear in the groups with the lower refractive errors.

Nevertheless the trend of the data in general, if we leave out those of Hirsch, seems consistent.

The abscissa then corresponds to steps on a visual acuity scale, in terms of 0.25 diopter ametropia. When the method of least squares is applied to these different sets of data, one obtains for the values R and the intercept of the best fitting line, the following:

Experimenter	R	*Intercept*
1. Laurance	1.273	0.925
2. Eggers	1.245	1.150
3. Hirsch	?	?
4. Crawford and associates	1.291	0.973
5. Rubin and associates	1.416	0.837

The average value of R for these four sets of data is 1.31. The average of R for these data is then between that of the Green scale ($R = 1.26$) and that of the Javal (Snellen) scale ($R = 1.41$). The intercept of $0.974' = 58.4''$ is not far from the origin of the log graph, indicating that acuity of 20/20 would exist for those without refractive error.

There may be other ways of plotting visual acuity so that the data of these experimenters would appear linear.[19] Because of this fact and the great variation in the results of different experimenters, one cannot be sure that the relationship between refractive errors and visual acuity constitutes evidence that a geometric progression has a physiologic and optical basis.

Choice of a geometric progression

A geometric progression that tends to give whole or simple numbers in the visual angle, in the Snellen notation or in the decimal notation, would be desirable. Such a scale actually is that already proposed by Green and by Ewing, in which $R = 1.26$. This scale also is not out of line with the suggested trend of the data for the visual acuity versus uncorrected ametropia. The gradation provides, therefore, an excellent compromise gradation. The scale is illustrated in Table 4.

The steps are numbered consecutively from the visual angle of 1.0 minute of arc; the steps for higher visual acuity would ordinarily be negative. The visual angles subtended by the letters of successive lines increase exponentially and are such that the largest number of whole numbers are obtained in the series. The Snellen notations are also simple, though in several instances there has been some rounding off to the nearest whole number.

The decimal notation is perhaps the least uniform. Inspection of this decimal scale shows that the steps are not regular and small changes in visual acuity have exaggerated importance in the poorer range of visual acuities.

Following the suggestion of Colenbrander, extracting the square root of these decimal notations(in the next column) tends to give a more uniform scale, except again for the poorest acuities. We could even simplify this part of the scale by reducing the number of steps here and by taking average visual angles in those steps whose notations are close together. Then differences of 0.1 give a uniform scale, except for the highest visual acuities. Even here it might be worth while to increase the number of steps to make this part of the scale also uniform with the rest. While this procedure does give a uniform scale, the notations are somewhat artificial and cannot be converted easily into other notations.

Criteria for the designation of visual acuity

The desirable designation for visual acuity which would also be acceptable for international use should be based upon the following criteria:

1. So far as possible, the designation should conform closely to the quantities and factors of visual acuity that are actually measured. In most visual acuity tests the factor of discrimination is resolution and this is measured by the visual angle subtended by the interruption of contours in the test details.

2. The designation should be adaptable to any degree of precision and should be readily

understood under any test conditions, whether used by the clinician or by the research worker.

3. The designation used should not be selected on the basis that the discrimination of a visual angle of 1.0 minute of arc represents "normal" visual acuity. All of our currently used systems for specifying visual acuity are fundamentally based on this theory. Thus, 20/20 notation is to tell us that the individual at 20 feet discriminates the test details which a "normal" eye should discriminate at 20 feet. It is common knowledge that emmetropic eyes can discriminate detail subtending a visual angle of considerably smaller than 1.0 minute of arc. The median in the distribution of nearly 1,200 subjects in the age groups 20 to 35 years was found by van Beuningen to be 53 seconds of arc. Thus a large proportion of these subjects were able to discriminate test characters which subtend much smaller visual angles than 50 seconds of arc. Thus the basis that a visual angle of 1.0 minute of arc represents normal visual acuity is erroneous.

4. The designation should not depend upon a particular gradation in the sizes of the letters of the test chart in order to obtain a uniform progression. A uniform decimal system does depend upon a particular gradation in letter sizes.

5. The designation used should be easily converted into any of the currently used systems of notation.

A study of the foregoing discussion brings one to a consideration of the only logical designation of visual acuity—namely, the visual angle subtended by the critical details of the test character. Minutes of arc are the units most easily handled. (Centrads, the 1/100th part of a radian angular measure, have been suggested, but for the most part this necessitates the use of decimals, and centrads are not understood by many.)

The advantages of the visual angle designation are:

a. It conforms to the actual quantity that is measured in the visual acuity test.

b. It carries no connotation of what is "normal" visual acuity. It indicates the actual ability of the subject; what sized objects can be discriminated. Its use would inculcate a more accurate idea of visual function even to the lay person, and is not subject to the misinterpretations inherent in other nomenclatures.

c. It in no way implies a relationship to visual efficiency.

d. Any scale of graduated sizes of letters or test characters in successive lines or areas of test charts can be designed.

e. Visual acuities determined at different distances can be directly compared.

f. Only one visual acuity scale is required, regardless of the acuity. Even the visual angle of "fingers at one foot" can be readily calculated.

g. Visual angles can be easily converted into any of the presently used systems for designating visual acuity.

h. It is a unit of measure of angle known throughout the world and hence is adapted for international use.

The disadvantages of the use of visual angle should also be mentioned, though these are not significant compared to the advantages. These are:

a. In any geometric progression for specifying the size of characters for a test chart, equal changes in steps in the high acuity range are not comparable with those changes in the poorer range of acuities.

b. There may be at first some confusion between visual angle and the decimal notations.

It is suggested that each line on the visual acuity test charts be labeled with both the Snellen index and the visual angle in minutes of arc.

Conclusions

Briefly the conclusions of the majority of the members of the committee are as follows:

1. Although among ophthalmologists and optometrists visual acuity charts are used primarily in determining refractive errors of

patients, the design of these charts should be such that determinations of visual acuity itself could be made with reasonable accuracy.

2. The Snellen notations, such as 20/30, 5/6 or 14/16, are admissible only if the visual acuity determinations have been made at 20 feet, five meters, or 14 inches, respectively. The numerator of the fractional representation should indicate the distance at which the visual acuity was measured. To apply the designation 20/20 to a visual acuity measured at 10 feet or at 14 inches is incorrect usage, and should be avoided.

3. Although there are as yet no published data which give experimental proof that a geometric progression in the sizes of the letters of successive lines of the visual acuity chart represents a physiologic attribute of different visual acuities, the majority of the committee members feel that this type of progression is desirable. A physiologic basis for a geometric progression might be found in the relationship between uncorrected refractive errors and visual acuity. The data on this relationship that are available in the literature tend to show such a geometric progression but the spread of the data between the various experimenters is such that the magnitude of a geometric progression cannot be satisfactorily determined.

4. The geometric progression in which the ratio of the size of the letters of a given line on the chart to that of the preceding line of smaller letters is of the order of 1.26 appears to be satisfactory and has also historical precedence. Several members of the committee felt that a rigorous adherence to a geometric progression was not necessary or important. Several visual acuity charts currently in use (for example, the A.M.A. visual efficiency chart) are not designed for rigorously geometric progression. On the other hand, those members of the committee with a military and research point of view believed that a geometric progression should be strictly adhered to. The charts should be made accurate, though perhaps the clinical designation need not be precise.

5. A careful study shows that it is impossible to work out a *uniform* decimal system (on the basis that the decimal is equal to the reciprocal of the visual angle in minutes of arc, that is, to the numerical value of the Snellen fraction) for designating the visual acuity of charts and preserve a geometric progression of the sizes of the letters of successive lines. Only if the decimals (or numbers) used have an arbitrary basis can such a system be employed. These are then useless for conversion or interpolation to other visual acuity scales unless tables are consulted.

6. Besides the foregoing fact there is the important objection to the decimal system that a given decimal always tends to connote a *percentage of normal vision*. One tends to compute mentally a percentage "loss" of vision at once. This implication is quite untrue and is often dangerously misleading.

7. The decimal system as well as the Snellen notation has the basic assumption that 1.00 represents "normal" vision. This is a misstatement of fact. The "normal" visual acuity of healthy eyes is probably better than 1.00. A large percentage of the population has visual acuities that exceed 1.00, although the "average" visual acuity for the whole population may turn out to be less than 1.00. It is unfortunate that the term 20/20 and its designation in decimal form have become a fetish in the popular mind.

8. The underlying factor in all visual acuity testing is the resolving power of the eye. The letters of the usual test chart and the international test object, the Landolt ring, are designed to measure so far as possible that resolution.

The members of the committee almost unanimously and strongly feel that visual acuity should be stated in terms of the quantity that is actually measured.

The advantages of such a system are obvious. Such a designation would be automatically international. It can be readily understood by all, including the layman. It

removes the fetish of the 20/20 concept, for there is no implication of a "normal" visual acuity. It is equally useful for the clinician and for the research worker.

Conversion to any of the presently used systems, meters or feet, centimeters or inches, can be made mentally. A visual acuity threshold of 2.3 would be 20/46 in the English system, or 5/11.5 in the metric system. One need only multiply the numerator—the test distance—by the visual acuity angle to obtain the denominator. Only lack of present usage and unfamiliarity argue against the adoption of the visual angle.

A start in the right direction would be to designate each line in the test chart both in the conventional system and in visual angle. This has already been done in the newly designed Armed Forces National Research Council Visual Acuity Test Chart.

9. Finally, it was felt by several members of the committee that the particular choice of letters in the lines of the visual acuity chart was a much more serious problem, but this lay outside the scope of the present committee.

Recommendations

The subcommittee, on the basis of discussion and of the considerations presented in this report, makes the following recommendations:

1. A decimal system for designating visual acuity should *not* be standardized for international use.

2. For the designation of visual acuity serious attention should be given at once to the adoption of the *visual angle of resolution* in minutes of arc of the component parts of the test letters of the chart. Such a designation is a direct statement of what is actually measured.

3. A geometric progression in the sizes of the letters of successive lines of the chart is desirable. However, *no particular* geometric progression should be standardized. The progression rate should be chosen according to the particular needs for a given chart.

4. In the event that the recommendation for designating visual acuity by the visual angle of resolution is not immediately acceptable (and it would perhaps take time and the work of many to make it acceptable) *no standard international designation system, decimal or otherwise,* should be adopted. The present decimal system is understood generally, irrespective of the meter or feet systems. There is nothing to be gained by adopting a *standard* decimal system.

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UNUSUAL TYPE OF DEGENERATIVE RETINOPATHY*

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It is an old and well-established fact that among the various pathologic conditions which affect the retina are changes which are classified as degenerative in type. Such changes may consist of hemorrhage, exudate, edema, atrophy, and loss of normal retinal structure—pigment, hyaline, and lipoid deposits and visible changes in the retinal vascular tree.

Even the comparative beginner in ophthalmology has observed such retinal abnormalities, especially in the instances where they are associated with the so-called degenerative diseases which frequently afflict human beings. But whether the observer be a neophyte or a veteran in the field of ophthalmology, in other instances, he may well ask, "Why do these retinal changes occur and what is the mechanism of their occurrence?" The answer is not always crystal clear.

My attention was redirected to this problem during the past year because of the experience which I have had in seeing a patient exhibiting advanced degenerative retinopathy producing incapacitating impairment of vision with very meager explanatory clinical and laboratory findings.

CASE REPORT

History. This was the case of a 52-year-old married white woman, a nurse, whom I first saw eight months ago. Vision in the right eye had been poor for three years prior to that date. During the six weeks before my first examination she had noted gradual and progressive loss of vision in the left eye. There had been no pain, photophobia, haloes, nor other ocular symptoms.

Examination revealed the vision in the right eye to be fingers at six feet, unimproved with lens. The external eye, adnexa, and the anterior segment of the globe were normal. The lens was clear, there were no vitreous opacities, the optic nerve head was normal, and the retinal arteries showed minimal constriction and narrowing; the veins were slightly overfilled, not abnormally tortuous.

Between the macular area and the disc were large deposits of hyaline and lipoid material in confluent lobulated masses. There was no foveal reflex and there was extensive loss of retinal elements in and around the macula with a few choroidal vessels clearly seen.

Above the macular area and scattered throughout the superior and inferior temporal quadrants were grayish-white lipoid and hyaline deposits with occasional pigment. There was no elevation of the retinal tissue; there were no hemorrhages. Tension was normal.

Vision in the left eye was fingers at 18 feet, unimproved with lens. The external eye and anterior segment were normal as were the lens and vitreous. The optic nervehead and retinal blood vessels appeared normal.

Extending from the macular area toward the disc and for a distance of about two disc diameters above and below was an area in which the retina appeared atrophic and thinned. Lipoid deposits could be seen throughout this area with occasional deep whitish exudative deposits.

In the immediate macular area, the atrophic tissue took on a yellowish color and was surrounded by retina which was speckled with whitish and bluish-black deposits. Lipoid and exudative deposits were scattered throughout the superior and inferior temporal fundus.

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A fresh superficial retinal hemorrhage was seen immediately below the macula; no elevation was ever noted; a large central scotoma corresponding to the macular lesion in each eye was present; the peripheral fields were normal. The patient was admitted to the hospital for study.

She was a 52-year-old obese individual, who, at the time of admission, was 5 feet 4 inches in height and weighed 221 pounds. She had been obese for many years and all members of her immediate family were obese; there were no known cases of diabetes in her family; there was no familial history of eye disease, nothing suggestive of a primary aberration; she had no ocular symptoms until the age of 49 years, but during the past three years had become gradually incapacitated to carry on her profession because of failing vision.

Thorough physical examination and *complete laboratory studies* were done in the hospital. A medical consultant found no evidence of vascular hypertension or arteriosclerosis. The fasting blood sugar was 85 mg., 90 mg., and 105 mg./100 cc. upon three occasions during her hospital stay and the nonprotein nitrogen was 33 mg./100 cc. Urine and blood examination was completely normal; blood Hinton test was negative.

Basal metabolic rate was —3 percent; an electrocardiogram was normal, as was a chest X ray.

The blood cholesterol level taken upon two occasions was 441 mg./100 cc. and 384 mg./100 cc. (Normal in this hospital is 180 to 250 mg./100 cc.)

Following the completion of these studies, patient was sent home upon the empiric treatment of rutin and vitamin-C therapy, potassium iodide, and a fat-free diet.

She has been seen by me at intervals since her discharge from the hospital and there has been no essential change in the appearance of the retinopathy, except an occasional superficial retinal hemorrhage in the left eye.

Discussion

Here, then, is a case of severe and damaging retinal pathology occurring in a patient in whom there is no clinical evidence of hypertension, arteriosclerosis, diabetes mellitus, or kidney disease. There were only two positive findings, namely, obesity and a markedly elevated serum cholesterol.

In order to attempt an explanation of such a retinal pathologic process, I have postulated that it has occurred upon a circulatory basis. I do not conceive of it occurring on a basis of vascular malformations, such as angiomatosis, or by reason of any degenerative disease upon an hereditary or familial basis; it certainly does not appear typical of inflammatory disease of the retina nor of tumor, nor of a developmental anomaly.

Based then upon the hypothesis that this pathologic condition has occurred because of underlying retinal vascular disease, I should like to refer to the elementary factors of tissue disturbances taking place upon a circulatory basis as recorded by Elwyn[1] and Ricker.[2]

These authors carefully describe the tissue changes and circulatory phenomena which occur as a result of vasomotor disturbances; they also record changes resulting from obstruction of blood vessels by compression from without, as by a new growth or from changes within the vessel itself, such as atherosclerosis, endarteritis, thrombosis, or embolism. They point out that, as a result of local circulatory disturbances, whether vasomotor, mechanical, or a combination of both, the following changes may occur: states of peristasis, prestasis, and stasis with (1) transudation of fluid, (2) hemorrhage, (3) infarction with conversion into scar tissue, (4) organization of hemorrhage when it cannot be absorbed, (5) the deposit of fat, lipoid, and hyaline material when the vascular supply to tissues is continuously insufficient.

In relating these phenomena to the retina, it is elementary to state that, if one is investigating such changes which are produced by vasomotor or mechanical defects in the blood vessels, one looks for (1) changes in the vessel walls, (2) transudation or edema, (3) hemorrhage, (4) fat, lipoid, and hyaline deposits, and proliferated glial and connective tissue.

The diseases which cause the abnormal retinal changes are many and include those causing changes in the vessel walls, functional constriction of the vessel wall, or combinations of both.

It is my belief that vasomotor changes in the retinal vessels are quite a remote possibility in the production of the retinopathy under discussion; the lesions seen in this case may have been produced in part by long continued functional constriction or angio-

spasm in the smaller arterioles and capillaries resulting in suboxidation of tissue and its consequences but, inasmuch as the only positive laboratory finding in this case was hypercholesteremia, it seemed impossible to dismiss this condition as not being related in some way to the ocular pathologic process.

The role of cholesterol, however, in relation to atherosclerosis is so vast and involved a subject that it cannot be properly discussed in any short paper. However, it is pertinent to recall that atherosclerosis, as distinguished from the more general term of arteriosclerosis, is characterized by deposits of cholesterol, fatty acids, and protein in the inner layers of the blood vessel wall, the factor or factors responsible for the abnormal deposition of cholesterol-containing materials in the inner layers of the blood vessel walls being unknown; a particular cholesterol-protein-fat complex in the blood may be a causative agent responsible for the development of atherosclerosis.

This is one of the most challenging problems under investigation and one of the most significant results of such research has come from the recent work of Gofman[3] and his associates in describing the differing physical properties and chemical composition of a group of lipoproteins contained in the total serum cholesterol.

Elevated blood levels of cholesterol have been observed in some individuals with the symptoms found associated with atherosclerosis and suggest that the increased concentration of this material might lead to its precipitation from the blood, with a subsequent "piling up" along the vessel wall and infiltration to the inner layers of the arterial wall.

Since high blood cholesterol levels are not always present in patients with vessel sclerosis, experimental testing of this hypothesis has been in progress over a period of years. Normal values for the total cholesterol content of blood serum have been established and found to vary with age; evidence points to rising values for serum cholesterol from youth through middle age and to lower values in surviving persons beyond 60 years of age.

Gofman and his associates, however, have presented evidence, in doing studies upon lipoproteins contained in blood plasma based upon analysis with the ultracentrifuge, that certain constituents of lipid-bearing materials are intimately associated with atherosclerosis; the basic premise of their work is that blood cholesterol, as such, is made up of a variety of very large molecules and that from the chemical determination of blood cholesterol alone one is not able to determine how the cholesterol is distributed among the numerous macromolecules that exist in serum.

They believe that, unless one is able to quantitate the various individual molecules present, no matter what the cholesterol level may be, their relationship to disease pathogenesis may be overlooked. It is for the detection of these particular lipids that they employ the ultracentrifuge; briefly it resolves in the fact that human serum lipids may be classified by their flotation rate in the ultracentrifuge, and by means of examination with a special optical system which determines the concentration and the flotation rate of these large molecules.

The lower members of the series have been noted in the blood of all persons studied. The presence of certain of the higher members of the series, however, characterized as Sf 10-20 molecules, has been reported only in the blood of certain patients with vascular diseases and evidence suggests that it is not the total cholesterol level in the blood serum, but the presence of these giant lipoprotein molecules which is associated with human atherosclerosis.

Patients with myocardial infarction, angina pectoris, hypertension with coronary artery disease, and diabetic patients with vascular disease all show higher levels of these molecules while the total serum level of cholesterol may be high, low, or intermediate.

The factors influencing the level of these

giant molecules suggest a general metabolic disorder in fat and cholesterol transport associated with this group of molecules which is involved in atherosclerosis.

A sample of this patient's blood was sent to Dr. Gofman at Berkeley, California, and he reported that the number of Sf 10-20 molecules was markedly increased.

It appears possible, therefore, in the case presented, in which the blood serum cholesterol was extremely high and in which the quantity of Sf 10-20 molecules was definitely increased, that, although ophthalmoscopically no evidence of vascular disease was visible, such changes in the retinal blood vessel wall might be present and might possibly be playing a role in the production of this retinopathy.

It is suggested then that this retinopathy can only be understood when the development of changes which follow local circulatory disturbances is kept in mind. The lesions observed in the retina in this case—namely, transudation of plasma, hemorrhage, hyaline and lipoid deposits, and loss of retinal elements—may well be due to long continued arterial narrowing partially on the basis of vasomotor imbalance but largely on the basis of arterial obstruction brought on by atherosclerosis associated with elevated serum lipoproteins.

It may be asked, if this is the case, why is there not more abnormality in the appearance of the retinal blood vessels?

Numerous cases have been reported, however, in which marked attenuation and narrowing of the retinal vessels have been described and pathologic examination revealed nothing histologically. If this be true, then the converse may also be true, namely, that narrowing may be present in the retinal arterioles and capillaries without being visible with the ophthalmoscope.

It seems not improbable, therefore, that the case herein reported, in which obesity, hypercholesteremia, and elevation of certain plasma lipoproteins were present, may represent some particular metabolic disorder which in some individuals may involve the retinal arteries, in others, the cerebral, in still others, the coronary or peripheral vascular system, the exact nature of which remains to be disclosed.

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THE TREATMENT OF CATARACT WITH GLAUCOMA*

A CONSIDERATION OF THE SINGLE AS WELL AS THE MULTIPLE OPERATIVE TECHNIQUE

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The skill of a surgeon is best shown by his handling of complications. One of the most serious problems for the ophthalmic surgeon is the complication of cataract with glaucoma.

The restoration of sight and the control of tension in cases of both cataract and glaucoma are rarely achieved with a single operation.[1] It is the purpose of this paper to analyze present-day methods of handling both cataract and glaucoma in the same eye.

Whenever cataract and glaucoma, of whatever type of combination, occur in one eye the prognosis is always more grave than if a single disease were present. In whatever combination, these two entities always lead to earlier surgery than when either condition is present separately. The course is invariably bad if the correct and complete diagnosis is not made early, and sometimes this condition is not successfully treated even when the diagnosis is correct and the operations well done.

Complications in addition to the ocular problem are to be expected in this group of patients, most of whom are in the 70-year age group. The determination of the type of surgery rests largely on the over-all picture.

While there is hope of salvaging usable vision, to declare even the most serious cases as inoperable does the patient a grave injustice. In one of my cases the single procedure was done in place of enucleation with a return of vision to 20/80.[1]

Too many elderly people are content to finish their days in semiblindness because they or their relatives fear surgery. Many elderly people fear even one operation, and yet the conventional treatment for cataract with glaucoma often requires at least two operations on each eye. When we explain to the patient that four or more operations offer the only chance of restoring sight in both eyes, it is no wonder that some of them reject treatment, and let the condition go on to blindness or enucleation.

Other patients fight gamely along as far as their financial and physical powers allow. How many succumb to heart disease, cerebral vascular accidents, or other terminal illnesses during the long operative and convalescent period? If four operations can be done on an elderly patient in less than two years (six months apart) average progress is being maintained.

PLANNING THE SURGICAL PROCEDURES

There are two categories into which all cataract and glaucoma patients may be placed:

1. Those patients in one's own practice, in whom the diagnosis is made early and in whom, perhaps, miotic therapy has been used for a long period of time.

2. Those patients who are referred to the surgeon when they are in the late stages of the disease, in whom often the glaucoma went unrecognized for a long period. Perhaps in such cases, one eye is blind and the other seriously affected.

Many of these patients, having been told of the cataracts, had expected vision to fail gradually until time for operation, but they had never known they had glaucoma because it had never been discovered.

The choice of surgical procedure depends on: (1) State of patient's health, (2) stage of the disease, (3) allowable time or number of operations the surgeon estimates the patient can stand, (4) vision available during the surgical period.

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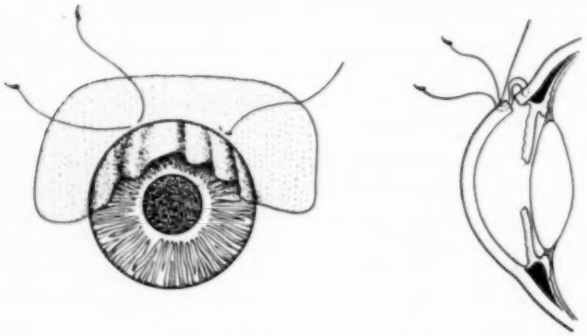

Fig. 1 (Birge). Frontal and lateral view of eye with conjunctival flap (10 mm.) turned down, dissected into cornea, section made, and sutures in place. (I now use one modified McLean suture, placed at the 12-o'clock position, in addition to the ones shown.)

If an early diagnosis has been made and plans for the protection of vision in one eye during the surgical period have been formulated, the surgeon may take as much time as he wishes (or has planned) and use as many operations as he feels are indicated.

If there has been a late or mistaken diagnosis of glaucoma, the surgeon must try to help the patient out of a serious predicament and save as much vision as possible. It is here that the conventional multiple operation schedule is less advantageous than one radical operation.

Some eyes (and patients) will stand the "double hazard" of a single radical operation, combining cataract extraction and a filtering operation for glaucoma, better than the multiple hazards of several operations.

A combined procedure for the relief of glaucoma with cataract was first used by me in patients who were obviously unable to stand multiple operations. One of the first cases was that of an elderly crippled woman in whom an iridectomy had been performed for acute glaucoma. A few months later the cataract had matured and the glaucoma recurred.

Rather than subject her to cataract extraction alone, and possibly later more surgery for the glaucoma, the combined operation of cataract extraction with iridencleisis was performed. It was successful; the tension remained controlled for many years and the vision was restored without further surgery. This result led to further use of the combined procedure in complicated cases.

Indications for the radical single operation

The indications for combining in one procedure a cataract extraction with a filtering operation for glaucoma are not rigid. Each surgeon can determine the usefulness of this operation more accurately by becoming better acquainted with it. One test of its usefulness is whether the surgeon is willing to repeat it on the fellow eye, as I did successfully in five out of 20 cases previously reported,[1] the other 15 cases having the single operation on one eye only.

The primary indications for choosing the single operation for both cataract and glaucoma are (1) to shorten the time required for restoration of vision and control of tension, and (2) to reduce the number of surgical procedures.

A single operation which combines cataract extraction and a filtering operation for glaucoma is best suited to advanced glaucoma

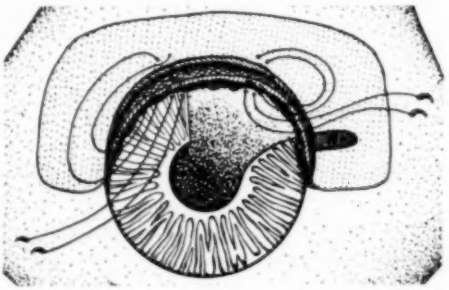

Fig. 2 (Birge). Iris pillar withdrawn beneath suture at lower edge of section. Conjunctival flap rolled back to visualize anterior chamber. Ready for any type of lens extraction.

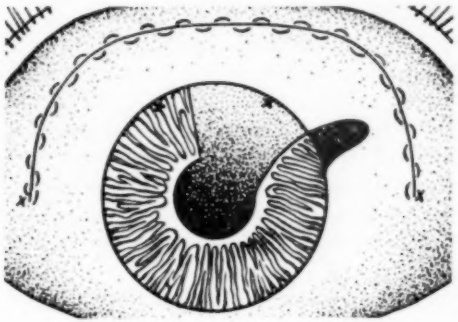

Fig. 3 (Birge). Operation completed.

with hypermature cataract (type II, table 1) and may be frequently used in Types III, IV, V, and occasionally in Type I. A differential diagnosis between Type II and the glaucoma due solely to the swollen lens (type III, table 1) is not difficult. In case of doubt, when one cannot be positive that the glaucoma is of short duration, it is safest to perform a single radical operation even though the additional filtration is not needed, no bleb forms, and the eye heals as after a simple cataract extraction, with small iris prolapse.

An unused iridencleisis does not lead to hypotony, as would a trephination.[4] In my opinion, there is no greater danger from iridencleisis done at the time of the cataract extraction than from iris prolapse, or iridenscleisis done separately. It is best to be conservative, however, and gradually prove the value of such a policy rather than adopt it without sufficient indications.

TABLE 1

SIX MOST COMMON TYPES OF CATARACT AND GLAUCOMA

Type	
I.	1. Early senile cataract (sclerosing or nuclear)
	2. Early chronic simple glaucoma (compensated)
II.	1. Hypermature cataract
	2. Acute glaucoma (superimposed on chronic glaucoma)
III.	1. Hypermature cataract
	2. Acute glaucoma due to cataract:
	a. Increased lens volume in eye
	b. Uveitis from degenerating lens
	c. Atropine
IV.	1. Mature cataract
	2. Trephination already present (or another filtering operation)
	a. With controlled tension
	b. With uncontrolled tension
V.	1. Complicated cataract (uveitis, etc.)
	2. Secondary glaucoma
VI.	1. Aphakia
	2. Glaucoma

TABLE 2

SURGICAL TREATMENT OF CATARACT WITH GLAUCOMA

(Multiple operation each eye)

1. Cataract surgery first:
   a. In simple hypermature cataract, with certain temporary secondary glaucoma (type 3, table 1)
   b. Some cases of postoperative glaucoma (type 4, type 1)
2. Glaucoma surgery first:
   a. In majority of cases
   b. When tension is not controllable with drops
   c. When vision is satisfactory

The single procedure of cataract extraction with iridencleisis is also indicated when the cataract is going to require extraction within a year from the date of the glaucoma operation—such cases are listed as Type IV—especially IV-b—Table 1. It is also indicated in those cases previously operated unsuccessfully and still having both glaucoma and cataract present.

In cases with uveitis, glaucoma, and cataract (type V, table 1), the prognosis is so poor that one has misgivings about recommending any surgery. In the cases reported[1] in my series, there were two, which were quiet enough from the standpoint of inflammation yet had high tensions that required surgery, in which the single combined procedure gave results that were better than expected.

In certain cases with early glaucoma and immature cataracts (type I, table 1) the single combined operation may be indicated but, for the present, these are exceptions; the majority of these cases probably require separate operations for each condition.

SINGLE SURGICAL PROCEDURE

Technique

1. *Similarity to iris prolapse.* The planned

TABLE 3

COMPLICATIONS FOUND IN 20 CASES
(In addition to cataract and glaucoma)

Over 70 years of age	10
Intracranial aneurysm	1
"Blocked currency"	1
Complete Arthritic Ankylosis	1
Diabetes	3
Severe hypertension	5
Tuberculous uveitis	1
Polycythemia	1
Sympathetic ophthalmia after surgery elsewhere	2
	25

addition of an iridencleisis to cataract extraction is no more dangerous than the complication of accidental postoperative iris prolapse.

2. *Type of cataract extraction.* A combined iridencleisis, using only one iris pillar, and cataract extraction is possible with either intracapsular or extracapsular extraction, as well as with combinations of cataract extraction, such as "with capsule."[2]

3. *The importance of a good conjunctival flap.* The cataract extraction combined with iridencleisis cannot be safely performed without a large, preferably heavy, conjunctival flap for two reasons: (1) It is needed to protect the iris "wick," and (2) to prevent epithelial downgrowth into the anterior chamber.

Some surgeons object to operating under a large conjunctival flap, but these objections must be discarded if one wishes to combine the two procedures. Good anesthesia and a good assistant are valuable in overcoming technical difficulties.

The anterior chamber is of importance in all stages of these complicated procedures—preoperatively and postoperatively.

In the preoperative stage, the anterior chamber is often shallow, for obvious reasons, and this complication frequently dictates special handling of the incision. A shallow anterior chamber preoperatively often obscures the view of the angle and makes diagnosis on this basis uncertain. Fortunately, other signs of prolonged glaucoma may help to indicate the necessary steps.

A shallow chamber postoperatively is a serious complication that is often seen in filtering operations for glaucoma. It is best avoided by careful section at the corneal limbus and by carefully preplaced, radial, corneoscleral sutures. If there is no overlapping of the flaps,[3] healing of the section wound and restoration of the chamber are usually rapid.

With a good iris "wick" in place, delayed reformation has no effect on the glaucoma; its only danger is in rare cases of fibrosis of the upper portion of the cornea. This complication has not been studied sufficiently to determine the etiology which may, however, be related to delayed reformation of the anterior chamber.

The iridencleisis is usually performed when the iris is cut. One pillar is placed in the far end of the section under the conjunctiva and away from the sutures, so that it will not have to be touched again.

I prefer a sclerecto-iridencleisis when dealing with a long-standing glaucoma in which most of the filtering areas of the normal eye are occluded. MacLean[5] prefers trephination in conjunction with cataract extraction.

DISCUSSION

Radical surgery often succeeds in cases in which less extensive procedures fail. Cataract with glaucoma is one of the most serious complications the ophthalmic surgeon has to handle. It may be possible, by performing both the cataract extraction and the glaucoma operation at the same sitting, to spare patients the trials and tribulations of multiple surgery.

At the present time, the radical operation of both cataract and glaucoma should be reserved for those patients who, in the opinion of the operating surgeon, cannot stand a long series of operations. This procedure has been sufficiently successful in my hands to make more liberal the indications for its use.

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COMPLICATIONS FOLLOWING CATARACT EXTRACTIONS*

An analysis of 1,001 cataract operations

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During the period from August, 1948, to May, 1951, 1,001 cataract operations were performed on clinical patients at the New York Eye and Ear Infirmary. This paper is a study of the types of surgery, complications, and final results of these consecutive extractions.

Surgeons and assistant surgeons performed some of these operations but the majority of them were done by resident physicians. Seven hundred and 49 of the 1,001 extractions were intracapsular and 252 were extracapsular; 183 of the latter group were first attempted as intracapsular.

Congenital, traumatic, complicated, and senile (immature, mature, hypermature) cataracts were included in this series. The patients ranged in age from three months to 90 years, but the average age was 65 years. There were 452 females and 549 males.

The study will be broken down into three main headings: (1) Preoperative factors; (2) operative techniques; (3) postoperative complications.

It was found after a survey of each case that 229 eyes suffered one or more complications. Table 1 lists the percentage of each complication found in the series.

Preoperative factors

Diabetes. Operations were performed on 99 eyes of diabetics. There were 57 intracapsular extractions and 42 extracapsular—

TABLE 1

Complications following cataract extractions

	Intracapsular Extractions (749) (%)	Extracapsular Extractions (252) (%)
Loss of vitreous	9.4	6.3
Iris prolapse	2.9	2.5
Incomplete closure of wound	2.1	2.0
Hyphema	4.6	4.9
Iridocyclitis	2.2	4.3
Secondary glaucoma	5.4	7.5
Retinal detachment	1.0	1.5
Secondary membrane		21.
Keratitis	0.9	1.2
Vitreous hemorrhage	0.2	0.4
Vitreous in contact with the cornea	0.5	0.4
Abscess of anterior chamber	0.1	0.4
Astigmatism over six diopters	0.7	0.8

* Presented in part before the New York Academy of Medicine, Section of Ophthalmology, May, 1952. From the Department of Research, New York Eye and Ear Infirmary.

TABLE 2

COMPLICATIONS IN DIABETICS

	Loss of Vitreous (%)	Iris Prolapse (%)	Incomplete Closure of Wound (%)	Hyphema (%)	Iridocyclitis (%)	Secondary Glaucoma (%)	Secondary Membrane (%)
Intracapsular, 57	5.2	7.0	1.7	3.4	1.7	10.5	—
Extracapsular, 42	4.7	2.3	—	9.5	9.5	9.5	33.

TABLE 2a

VISUAL RESULTS IN THESE CASES

	20/15–20/30	20/40–20/70	20/100–20/200	Less than 20/200
Intracapsular	19	24	9	9
Extracapsular	7	15	7	9

of which six were intentionally extracapsular.

Table 2 shows a relatively higher frequency of secondary glaucoma in diabetics than in nondiabetics. It is also evident that the incidence of hemorrhage into the anterior chamber and secondary iridocyclitis are more common in extracapsular extractions among diabetics.

The majority of such incidences occurred in unintentional extracapsular extractions. The unintentional extracapsular operations were, almost without exception, due to inadvertent tearing of the capsule.

This situation naturally carries with it other inadvertent occurrences which produce added trauma, and this entire situation leads to the expected poorer result. The hemorrhages and other complications do not seem to bear any relationship to the blood sugar for all patients were well controlled.

Diabetic retinopathy was severe enough in 18 of these cases to prevent good visual results (table 2a).

PREËXISTING GLAUCOMA. This condition was found to be present in five percent of the cases. These included all forms and all stages of the disease. The figure is less than the estimate given by Knapp[1] who found it present in nine percent of cataract extractions.

It is interesting to note the small incidence of postoperative complications in these cases (table 3). There were good visual results in 34 cases. Of the three with glaucoma capsulare, one had vision of 20/30 after the operation, and the other two had poor results due to the progression of the glaucoma. Of the three cases of glaucoma resultant from swollen lens, one was found to have an intraocular tumor, and the other two were unimproved after extraction of the lens.

Follow-up of these cases revealed that 43 were controlled following cataract extraction: 30 without further treatment, nine required miotics, and four were controlled only after surgery. The remaining eight were uncontrolled. Lee and Weil in a study of 100

TABLE 3

COMPLICATIONS IN PATIENTS WITH GLAUCOMA

Number	Previous Surgery (%)	Glaucoma Capsulare (%)	Swollen Lens (%)	Loss of Vitreous (%)	Iris Prolapse (%)	Incomplete Closure of Wound (%)	Hyphema (%)	Secondary Membrane (%)
51	21.5	3	3	1.9	1.9	1.9	4.9	5

TABLE 4

COMPLICATIONS IN MYOPIA

Number	Loss of Vitreous (%)	Hyphema (%)	Iridocyclitis (%)	Secondary Glaucoma (%)	Retinal Detachment (%)
54	7.4	4.8	1.8	5.5	3.7

cases found that 92 were controlled and eight remained uncontrolled. In the controlled cases, 16 were given miotics, and eight required cyclodialysis.[2]

Myopia. There were 54 cataract extractions in highly myopic eyes. Of these, 11 eyes developed complications (table 4). The only significant feature in this group was a higher incidence of retinal detachments following extraction.

Complicated cataracts. There were only four cases which were definitely proved to be complicated cataracts. After surgery there was no improvement in one and vision was improved to 20/30 in the other three.

Bilateral dislocated lens. There were three eyes surgically treated in patients with this condition. Two were improved to 20/50 and one to 20/100 after extraction. Exfoliation of lens capsule without increased intraocular pressure was noted in two eyes and both had 20/40 vision after extraction.

Traumatic cataracts. There were seven extractions in this series. One came to enucleation, the other six were not followed.

Congenital cataracts. Eleven eyes had extracapsular extractions with one resulting in 20/20 vision, another in 20/30 vision, and three in 20/70 vision. Two had only light projection, three were not refracted, and one died from intercurrent pneumonia.

The series in these various types of cataracts were too small numerically to evaluate adequately the procedures used.

Macular function tests. An attempt was made to study the various macular function tests which are currently being used. The most widely used tests are light projection, red- or green-glass test, and two-light test.

In the cases which had vision of 20/100 or less postoperatively, due to some preëxisting condition such as optic atrophy, chorioretinitis, macular degeneration, myopic or diabetic changes, 14 of those recorded were found to have some or all of the tests normal.

On the other hand, a number of cases in which poor function tests were reported had good visual results following surgery. It could be assumed that the poor tests were due to hypermature cataracts which prevent light from passing through because of the denseness of the cataract. On the whole, it might be concluded that the various currently used tests are not adequate.

OPERATIVE TECHNIQUES

Conjunctival flap. Eighty percent of the operations were performed with fornix-based flaps and the remainder were done with limbal-based flaps or no flaps at all.

The fornix-based flap has proved very satisfactory because it allows for a clearer view of the corneal and scleral edges, thus simplifying the section and the insertion of the sutures. The flap can be brought down and secured over the wound by means of two wing sutures, and it will usually remain in place for 10 to 12 days.

This method seems practical for there is no conjunctiva to get in the way of complicated maneuvers, and it eliminates the necessity of incorporating conjunctiva in the sutures which may lead to insecure approximation of the wound.

The objection to this type of flap is the feeling, by some ophthalmologists, that epithelial downgrowths are more common with this procedure. This was not found to be so.

Corneal section. Discussion lately has centered on the preferred method of making a

TABLE 5

COMPARISON OF KERATOME AND GRAEFE-KNIFE INCISIONS

	Loss of Vitreous (%)	Iris Prolapse (%)	Irido-cyclitis (%)	Hyphema (%)	Incomplete Closure of Wound (%)	Retinal Detach-ment (%)	Secondary Glaucoma (%)
Keratome, 120	9.1	3.3	2.4	7.4	1.7	1.7	6.6
Graefe-knife, 881	8.6	3.4	2.9	4.1	2.0	1.2	5.9

corneal incision. Some suggest the use of the keratome, especially for the occasional operator. Atkinson[3] feels that, in addition to being a simpler procedure, it makes for a long beveled corneal incision which minimizes wound leaks and decreases the frequency of postoperative hemorrhage.

Davis,[4] on the other hand, in studying the postoperative complications after 257 cases with keratome-scissors incision and 202 cases with Graefe knife incision, concluded that knife incision is better. He found more frequent cases of hemorrhage into the anterior chamber, iridocyclitis, delayed restoration, and late loss of chamber, incomplete closure of wound, choroidal separation, and secondary glaucoma with the keratome.

In the series under study the only outstanding difference was in the higher incidence of hemorrhage into the anterior chamber following the use of the keratome (table 5).

Sutures. The frequency of postoperative complications has been considerably reduced by the use of corneoscleral sutures. This is borne out by Hughes and Owens[5] in their analysis of 2,086 cataracts performed at the Wilmer Institute over a 19-year period. In these extractions there was a change from the combined extracapsular method without sutures to the present method.

In all but four cases of our series, corneoscleral sutures were used. Four percent showed hemorrhage into the anterior chamber, 2.1 percent had incomplete closure of wound, and 2.3 percent had iris prolapse.

Three fine black silk sutures at the 12-, 1-, and 2-o'clock positions have been almost universally employed by ophthalmic surgeons. At present there is preference among the surgeons of the New York Eye and Ear Infirmary for mild chromic (6-0) catgut sutures. The advantage of catgut is its avoidance of complications incident to the removal of sutures. Absorbable gut results in more tissue reaction in the first three postoperative days, but thereafter there is no marked difference.[6]

Statistics were obtainable for the last 333 operations in this series, of which 151 were done with silk sutures, and 182 with catgut. Since this series was so small it cannot be considered representative. No important conclusions could be drawn for there was a larger number of incomplete closures of the wound in the cases where silk was used, and on the other hand there was a larger number of iris prolapses in the cases where catgut was used.

Iris surgery. Complete iridectomy is indicated whenever there is a rigid, nondilatable pupil. Round-pupil extraction may be utilized for the cosmetic effect. It also may aid in the prevention of vitreous prolapse.

Sixty-five percent of the cases in this series had complete iridectomies, while 35 percent had round pupils. Of the latter group, 60 percent had iridotomies, 37 percent had peripheral iridectomies, and three percent had basal iridectomies.

When intracapsular extractions were employed, the percentages of postoperative complications were similar with round pupils and complete iridectomies. In unintentional extracapsular extractions the number developing complications following round pupil surgery was only half that following complete iridectomy. This might be explained by the

TABLE 6

COMPLICATIONS FOLLOWING VARIOUS TECHNIQUES

	No. of Cases with Complications (%)	Loss of Vitreous (%)	Incomplete Closure of Wound (%)	Iris Prolapse (%)	Hemorrhage in Anterior Chamber (%)	Iridocyclitis (%)	Secondary Glaucoma (%)
Extracapsular-full iridectomy, 69	5.8	2.9	1.4	2.9	2.8	2.9	1.4
Extracapsular unintentional full iridectomy, 142	18.1	4.9	0.7	3.5	2.6	4.9	7.0
Extracapsular unintentional round pupil, 41	9.7	9.7	—	2.9	5.8	7.3	2.9
Intracapsular-full iridectomy 507	18.3	9	2.3	2.7	4.3	1.6	5.1
Intracapsular Round pupil, 242	17.8	9	1.7	2.8	5.8	2.8	5.8

tendency of most surgeons to complete the iridectomy after the extraction in those cases which seem unfavorable thus reducing the number of round pupil cases.

Method of extractions. Table 6 shows that the percentage of cases with complications was less following extracapsular extractions. However, this does not include the large number of secondary membranes. When those cases are taken into account, the complication figure for extracapsular extraction rises to 30 percent. This is the prime reason for the preference of most ophthalmologists for the intracapsular procedure.

Berens and Bogart[7] in a similar study of 1,004 cataract extractions, of which 702 were extracapsular and 302 were intracapsular extractions, concluded that there was little difference in the postoperative complications between the two methods.

Loss of vitreous. Of 87 eyes which lost vitreous, 71 were intracapsular extractions, 16 were extracapsular. One or more complications developed in 31 eyes (table 7).

This demonstrates that loss of vitreous which followed extracapsular extractions increased the frequency of complications much more than in the case of intracapsular extractions. Knighton,[8] in a study of 1,000 intracapsular extractions, found that postoperative complications were four times more frequent when vitreous was lost.

This finding is much higher than in the series under study. Only 10 percent of these patients who developed complications had vision of 20/70 or better. Sixty-six percent of the whole group involving vitreous loss had vision of 20/70 or better.

POSTOPERATIVE COMPLICATIONS

Incomplete closure of the wound. There were 21 cases which fell into this classification. Included are those cases which failed to form a chamber or which lost the chamber during the period of hospitalization. Two cases followed removal of silk sutures and one was found in a case where plain catgut was used. No other significant factors were discovered.

Gradle and Sugar[9] in their study of wound rupture after extraction concluded that increased intraocular pressure brought about

TABLE 7

COMPLICATIONS FOLLOWING LOSS OF VITREOUS

	No. of Cases Developing Complications	Hyphema (%)	Secondary Glaucoma (%)	Secondary Membrane (%)	Retinal Detachment (%)	Iridocyclitis (%)
Intracapsular	22	4.8	11.2	7	4.2	4.2
Extracapsular	9	12.8	12.8	40	9	12.8

by forcible contraction of the orbicularis and external ocular muscles was the important factor.

In the treatment of these cases, seven were the wound cauterized, four had air injections resutured, six had the sutures removed and with posterior sclerotomy. The remaining four reformed without further treatment.

The best visual results were obtained when the sutures were removed and the wound was cauterized; the poorest were obtained where air was injected and a posterior sclerotomy was done. The incidence of secondary glaucoma following wound rupture was 14.3 percent. This is not as high a percentage as expected.

Hemorrhage into the anterior chamber. The problem of hemorrhage into the anterior chamber following cataract extraction has been thoroughly investigated. Wheeler[10] found hyphema to be less common after preliminary iridectomies.

Vail[11] concluded that hyphema was a result of wound reopening and rupture of newly formed blood vessels at the section, especially between the third to sixth days. Direct trauma is the usual cause but many hemorrhages seem to occur spontaneously. In a few cases a rupture or diapedesis from diseased iris vessels as a result of inflammation cause the bleeding.

Neff,[12] in a careful study of 98 patients with hyphema, found, in addition to trauma, factors such as hypertension, low platelet values, low and high hemoglobin. Increased capillary fragility also played a role in causing these hemorrhages. Most authors agree that diabetes is not a factor.

The frequency of this complication varies with different authors. Vail[13] reported it in eight percent. DeVoe[14] found it in 20.9 percent. Hughes and Owens[15] discovered that when two corneoscleral sutures were employed, the incidence was 4.7 percent, and 13.3 percent where only one was used. They thus concluded that corneoscleral sutures are important in preventing this complication.

In our series there were 4.6 percent in intracapsular extractions and 4.9 percent in extracapsular extractions. A history of trauma either at operation or during the postoperative period was found in 60 percent. Secondary glaucoma occurred in 20 percent of these cases and retinal detachments in 10 percent. This high incidence is probably due to trauma.

Iris prolapse. There were 32 cases in which iris prolapse was found. Twenty-two (2.9 percent) followed intracapsular extractions, 10 (2.5 percent) followed extracapsular extractions. Six cases (1.7 percent) followed round-pupil extraction. Sixteen cases required further surgery, either excision or cautery of the prolapse. There seems to be a higher incidence of prolapse in diabetics.

The loss of anterior chamber is a frequent accompanying complication. Twenty-two cases had vision of 20/70 or better despite this complication. In the management of these cases Kirby[16] recommends an attempt to replace iris if found within 24 hours and if covered with conjunctiva. If uncovered, it is best to excise the area.

If the iris is ballooned out by the aqueous there is danger of further increasing the fistulous opening. This should be drained and excised. When the iris is covered with conjunctiva, caustics are contraindicated.

Iridocyclitis. The most devastating complication of cataract extractions is iridocyclitis. In our series of 28 cases only eight had vision of 20/70 or better following the complication.

The incidence is highest in extracapsular extractions. This may be due to reaction from retained lens material, or in the unintentional extracapsular extractions, it may be due to the necessarily more traumatic procedure. Loss of vitreous also seems to play a part. Cortisone, if utilized early enough, may improve the prognosis.

Secondary glaucoma. This condition developed in 60 cases; 49 (5.4 percent) following intracapsular extraction and 19 (7.5 percent) after extracapsular extraction. Of these, 30 were found to have useful vision,

23 had no useful vision, and three were not followed.

Secondary membranes were present in 11, iridocyclitis preceded 10, and vitreous loss 11. Incomplete closure of the wound preceded three; and eight of the patients were diabetic. All these might be factors in the causation of secondary glaucoma.

Secondary membrane. In this series there were 89 cases which had secondary membranes. Of these, 57 followed unintentional extracapsular extractions, 29 followed planned extracapsular extractions, and three followed intracapsular extractions.

Discissions were performed in 45 cases, with useful vision resulting in 31. Of the 14 which were unimproved after discission, 10 were in planned extracapsular extraction. In 15 cases, other complications were present, and they were severe enough to postpone surgical treatment.

Retinal detachments. Twelve cases developed postoperative retinal detachments. Eight were intracapsular extractions and four were extracapsular extractions. The retina was reattached in only four cases following surgery. The factors which seem to play a part in causing early detachments are myopia, loss of vitreous, and trauma to the eye during the convalescent period.

Epithelization of anterior chamber. There were five cases which were thought to have developed this condition. Beta radiation was used in three of them. Since none of these eyes came to enucleation, the diagnosis was never confirmed. This condition is not common. Estimates vary from 0.6 percent to 1.1 percent in all cataract extractions.

In two of the five cases mentioned above, fistulization of the wound was present. This is the only factor which possibly plays a part in causing this condition.[17] Pincus,[18] in a complete study of five cases, was unable to point up any other outstanding factors. Some hold the opinion that the type of flap is a factor. In two of these cases, limbus-based flaps were used; the remaining three utilized fornix-based flaps.

Conclusion

1. Table 8 shows the visual results in the cases under study.

2. There was a higher incidence of secondary glaucoma in diabetics. Diabetics who had extracapsular extractions developed hemorrhages into the anterior chamber and iridocyclitis more frequently than those upon whom intracapsular extractions were performed.

3. Preëxisting glaucoma did not increase the frequency of complications after removal of the cataract.

4. Highly myopic eyes showed a tendency toward development of retinal detachments.

5. Macular function tests as used in these cases did not prove to be adequate.

6. Fornix-based conjunctival flaps were found to be satisfactory.

7. No outstanding difference in the number of complications could be found between those cases in which fine silk and those in which chromic catgut sutures were used.

8. The rate of complications was the same with round pupils as with complete iridectomies in intracapsular extractions.

9. Intracapsular extraction proved to be the method of choice because of the high incidence of secondary membranes after extracapsular extractions.

10. Loss of vitreous increased the number of complications, especially in extracapsular extractions.

TABLE 8

Visual results

20/15–20/30	20/40–20/70	20/100–20/200	Less than 20/200	Not Refracted	Enucleated
381	383	69	80	80	8

11. The method which gave the best results in the treatment of incomplete closure of the wound was the removal of sutures and cauterization of the wound.

12. Trauma was the important factor in the development of hyphema.

13. The development of iridocyclitis following cataract extraction was a sign of poor prognosis. Trauma during the operation, loss of vitreous, and presence of lens material in the anterior chamber may be factors in the production of this complication.

14. Secondary glaucoma was found to be more frequent in those cases where vitreous was lost and where iridocyclitis, secondary membranes, or a leaky wound were present.

15. The only etiologic factor found in the production of epithelial downgrowths was incomplete closure of the wound.

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ATOPIC KERATOCONJUNCTIVITIS*

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The association of a number of dermatologic entities with lesions in the conjunctiva and cornea has been known for many years. The most important of these diseases are: acne rosacea, infectious eczematoid dermatitis, seborrheic dermatitis, erythema multiforme, pemphigus, psoriasis, and congenital ichthyosis.

The skin lesions of acne rosacea are restricted to the face and are characterized by the development of erythema, indurated nodules, and eventual telangiectasia of the skin of the nose, cheeks, and eyelids. A blepharoconjunctivitis and keratitis are commonly associated. The early corneal changes consist of a gray superficial opacification and vascularization of the entire limbal area, especially the upper half. Catarrhal infiltrates may develop in the limbus at any stage as a result of secondary infection.

Infectious eczematoid dermatitis may be accompanied by a blepharoconjunctivitis of bacterial origin, usually staphylococcic. A keratitis, characterized by formation of catarrhal infiltrates and ulcers which are followed by secondary vascularization may develop during the course of this skin disease.

Seborrheic dermatitis affects the scalp (dandruff), forehead, brows, lid margins, chest, axillae, and groin. The lesions are chronic, reasonably circumscribed, elevated, scaly, and hyperemic. Secondary infection frequently occurs. A conjunctivitis is not uncommonly associated with the blepharitis, even in the absence of secondary infection. A type of primary peripheral epithelial keratitis may be associated with the blepharoconjunctivitis.

The conjunctival and corneal changes accompanying erythema multiforme are acute and self-limited and in all probability would not be confused with the condition about to be described. The same may be said of pemphigus, with the addition that the ocular lesions are frequently progressive and more destructive.

Psoriasis affects mainly the extensor surfaces of the limbs, the scalp, and the trunk and is characterized by plaquelike hyperemic lesions which are covered by scales. The face and lids are rarely affected. A conjunctivitis and keratitis have been described in this condition, either with or without psoriatic lesions of the eyelids. Peripheral epithelial and stromal involvement may occur.

Congenital ichthyosis may resemble atopic dermatitis but the cutaneous lesions are present at birth and are more widely distributed.

The term atopic eczema or dermatitis is well known to ophthalmologists, mainly because of the relationship between this condition and the development of cataracts. In view of this knowledge it is surprising that, as far as can be determined, the occurrence of a typical keratoconjunctivitis has never been described in this condition.

During the past four years I have encountered five cases of atopic eczema which had an associated bilateral keratoconjunctivitis. The course of the disease and the character of the corneal and conjunctival changes are so typical that it is felt this entity deserves the specific title "atopic keratoconjunctivitis."

A search of the literature has failed to reveal a previous report of this condition. Important articles on allergic conjunctivitis and keratitis have been examined to de-

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termine if the cases showed an associated typical dermatitis but none was encountered. Monographs on the association of eye diseases with various dermatoses fail to mention this condition.[1, 2]

The cutaneous lesions in patients with atopic eczema are exceptionally persistent and symmetrically distributed areas of chronic inflammation characterized by thickening of the dermis, scaling, exaggeration of the minute folds, and more or less pigmentation. The surface is generally dry, but may be considerably excoriated because of severe and characteristic pruritis. Secondary infection and dermatitis from medication are commonly observed.

The sites of predilection are the antecubital and popliteal areas, the sides and the back of the neck, face, head, axillae, shoulders, and thorax. The lower trunk and extremities are usually free. The course of the disease is chronic, with intervals of months or years between severe exacerbations.

The term "atopy" was devised by Coca[3] to apply to cases of human hypersensitivity which show a hereditary influence. Many observers have urged the recognition of atopic dermatitis as the childhood and adult manifestations of infantile eczema; others would include cases of rhinitis, hay fever, asthma, and urticaria.

The atopic individual is believed to become sensitized during infancy at which time he manifests an infantile eczema. His sensitivity later becomes multiple so that almost no environment is possible wherein an absence of sensitivity exists or may develop.[4] Efforts to desensitize atopic individuals are usually not successful. There is usually an elevated eosinophil count in the blood and in various body exudates.

Atopic patients show positive intracutaneous and scratch tests of the "immediate" type with a wheal and erythematous reaction. Patch tests are usually negative. There are positive circulating antibodies or "reagins" in the blood and these reagins are transferable (Prausnitz-Kustner reaction). Coca demonstrated that the antibodies in human allergic reactions have certain differences from those in animal anaphylaxis and these he termed reagins. The sensitizing substances he termed atopens.

The offending atopens are pollens, plants, dander from animals and insects, spores, dusts and powders, clothing, cosmetics, serums and vaccines, parasites, and drugs. There is often a very definite associated hay fever, asthma, rhinitis, or urticaria.

Brunsting,[5] in a survey of 101 cases of atopic dermatitis, found that 71 had a history of infantile eczema, asthma, and hay fever. The ages in his cases varied between 15 and 35 years and there was no sex predilection. Ten of the cases were complicated by a cataract, but no mention was made of a keratoconjunctivitis.

Conjunctival and corneal changes

The conjunctival and corneal changes in my patients were so similar that a general description of the lesions may be given prior to presentation of the case reports.

At a variable interval after onset of the dermatitis, a bilateral conjunctivitis makes its appearance. The symptoms at this time consist of burning and a moderate mucoid secretion. The conjunctival inflammation may undergo exacerbations and remissions, coincident with those in the skin. Secondary infection with bacteria, usually pathogenic staphylococci, may occur.

The keratitis may appear with, or follow, repeated exacerbations of the conjunctivitis. Usually the superficial third of the peripheral cornea is first affected. The corneal stroma in the region of Bowman's membrane becomes hazy and the bulbar conjunctival vessels engorged. After a variable interval the opacity spreads farther into the cornea and vascularization occurs from the limbus. The epithelium over the area of keratitis is slightly edematous and shows minute points of straining with fluorescein.

Over a period of years fresh areas of peripheral keratitis develop, followed by

vascularization. In my most advanced case the entire cornea became hazy and vascularized, with resulting lowered acuity. If the attacks of keratitis are mild the disease remains localized to the periphery, but if the keratitis is severe and persistent it becomes diffuse.

There is no associated intraocular inflammation. If a secondary infection occurs, catarrhal infiltrates may appear in the peripheral cornea and form shallow ulcers. These lesions, however, are distinct from the primary keratitis.

Case reports

Case 1.

A white man, a drug manufacturer, aged 47 years, had, as a chief complaint, chronically inflamed eyes with gradual visual loss for seven years.

Past history. At the age of 15 years he developed a nonseasonal type of hay fever and occasional attacks of asthma. His mother and one daughter had asthma. The asthmatic attacks of the daughter were precipitated by colds.

Present history. A dermatitis of the face, neck, and arms developed in 1937. During 1942 the left eye became inflamed and caused burning, tearing, and itching. Various treatments were without effect. He was examined by an allergist in March, 1944, and found to be sensitive to 10 ingestants, five environmentals, 22 pollens, and to house dust. Desensitization over a period of two months afforded some relief from the ocular inflammation.

In April, 1944, slight symptoms appeared in the right eye, In September, 1944, vision in each eye was 20/25 corrected.

The skin of the lids was red and thickened and the palpebral and bulbar conjunctivas were inflamed. Circumcorneal injection was present and a slight inflamed ridge was seen at the limbus of both eyes. On slitlamp examination, he showed numerous punctate epithelial staining areas. A fine diffuse opacification was noted at the level of Bowman's membrane, more on the left eye. Cultures showed pathogenic staphylococci, and smears showed rare eosinophils from the left conjunctiva. Treatment was again without effect.

The eye and skin conditions progressed with exacerbations and remissions until February 11, 1948, when vision in the right eye measured 15/200 and in the left eye 10/200. The skin of the lids was thickened, scaly, and hyperemic and the conjunctivas were inflamed and hypertrophic with considerable mucous discharge. Both corneas were partially opaque and vascularized (figs. 1 and 2).

Fig. 1 (Hogan). *Case 1.* Right eye. Conjunctival and corneal inflammation.

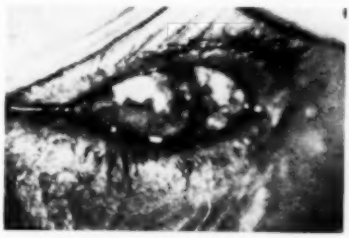

Fig. 2 (Hogan). *Case 1.* Left eye. Corneal scarring and inflammation.

General examination showed a scaly atopic eczema of the arms, neck, forehead, ears, groin, and popliteal areas. Cultures of the conjunctiva showed pathogenic staphylococci in large numbers. Scrapings showed many eosinophils. Antibiotic therapy and local treatment were without effect.

He was next seen on December 27, 1949. The ocular and cutaneous conditions had become progressively worse (fig. 3). Vision in the right eye was counting fingers at one

foot and in the left eye counting fingers at two feet. The corneas were more opaque because of yellow-white deep opacities which were vascularized (figs. 4 and 5). The conjunctiva was hypertrophic and congested. The lenses were normal.

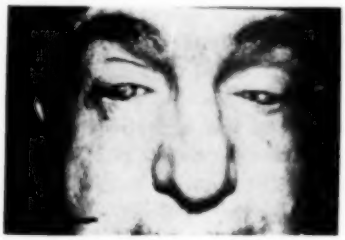

Fig. 3 (Hogan). *Case 1.* Active atopic eczema and increased corneal scarring.

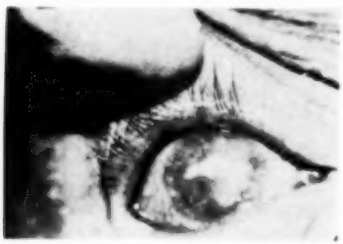

Fig. 4 (Hogan). *Case 1.* Right eye. Corneal scarring and inflammation in December, 1950.

Parenteral treatment with cortisone was started on January 3, 1950, and continued to March 10, 1950, with a very satisfactory response. The conjunctival scrapings showed no eosinophils after the 23rd day of treatment. Vision in the right eye improved to 2/200 but vision in the left eye was unchanged. At the end of a month the dermatitis had almost entirely disappeared.

Discontinuance of cortisone was followed by a prompt relapse. ACTH was then given but caused very little improvement in the symptoms and signs because of a poor adrenal response. Oral cortisone was started after April 17, 1950, and continued for almost a year, following which it was gradually decreased and topical cortisone substituted. During this time no systemic disturbance appeared as a result of the cortisone

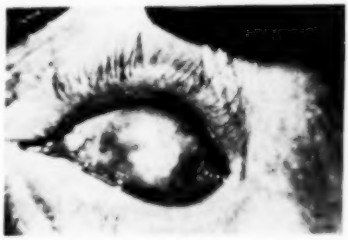

Fig. 5 (Hogan). *Case 1.* Left eye. Corneal scarring and inflammation in December, 1950.

therapy and the skin and ocular conditions remained entirely quiescent. Following cessation of parenteral cortisone treatment in April, 1951, there was no relapse of the conjunctivitis, keratitis, or dermatitis.

Since that time, the patient has been carried for almost a year on topical cortisone. A corneal transplantation was done on each eye while he was taking cortisone orally. This surgery resulted in a visual acuity of 20/80 vision in the left eye and 20/30 in the right eye. Wound healing was not interfered with while he was taking cortisone. In November, 1951, he became somewhat refractory to topical cortisone, a conjunctival eosinophilia recurred, and cultures again became positive. Topical Compound F produced an immediate subsidence of symptoms and since this time he has shown no tendency to relapse.

CASE 2.

A white man, a bakery salesman, aged 38 years, had blurring and inflammation of both eyes for one month.

Past history. He had an infantile eczema as a child involving the face, neck, hands, antecubital areas, and back. The skin condition persisted through childhood into adult life, with exacerbations and remissions. Redness, scaling, itching, and occasional weeping were present on the face, neck, hands, and arms. He had been studied repeatedly as a child without determining the specific causative factor. The family history was negative for evidence of allergy.

Fig. 6 (Hogan). *Case 2.* Atopic eczema of the face and neck with keratoconjunctivitis.

The eyes first became inflamed at the age of 33 years while he was in the army. Blurring, redness, photophobia, and itching were present. At this time the ophthalmologist commented to the patient that he had some peculiar corneal lesions. Since discharge from the army in 1945, he had periodic exacerbations in the skin and occasional slight attacks of conjunctivitis.

Present illness. In December, 1950, the skin condition relapsed, both eyes became inflamed, and the vision was markedly reduced. Constant burning, tearing, and mucopurulent discharge were present. On examination vision in the right eye was 18/200 and in the left 20/80, with correction.

Physical examination showed an atopic eczema of the face, neck, and shoulders with crusting, hyperemia, and discharge (fig. 6). The remainder of the skin was normal.

Examination of the eyes showed a diffuse fairly marked haziness of the corneas, due to an inflammation of the superficial stroma. Peripheral vascularization was present. Within the limbus approximately one to two mm. was a gerontoxonlike lesion (figs. 7 and 8). The central corneas were not vascularized. There was no evidence of ulceration, and on staining with fluorescein multiple punctate epithelial areas were seen in the lower halves of the corneas. There were no changes in the lenses.

Allergy tests showed a variety of positive reactions, but it was not deemed advisable to attempt desensitization in the case. The patient was treated with intramuscular cortisone from January 30, 1951, until February 10, 1951, starting with 300 mg. the first day, 200 mg. the second day, and 100 mg. thereafter.

An almost immediate improvement occurred in the skin, corneal, and conjunctival lesions. Within four days most of the itching and weeping had disappeared. By February 4th, vision in the right eye was 20/80 and in the left it remained at 20/80. There was no corneal staining, although the corneal haziness seemed to persist.

On February 10th, vision in each eye was 20/70 and the conjunctiva was clear. On February 13th, vision in each eye was 20/30. The patient was placed on drops of cortisone acetate suspension in a dilution of 1:4, at hourly intervals. He was followed as an outpatient for several months during which period there was no relapse of the dermatitis. Topical cortisone drops were gradually reduced to four times a day and there was no evidence of recurrence of the keratitis or conjunctivitis. He has been seen at three-to six-month intervals since this time. The vision is unchanged and there has been no relapse.

CASE 3.

A white man, a salesman, aged 36 years, had redness, watering, and discharge from both eyes for two months.

Past history. The patient had a long history of severe allergies commencing during childhood. A skin rash involving the face, neck, arms, and chest appeared in infancy and continued through childhood into adult

Fig. 7 (Hogan). *Case 2.* Gerontoxonlike lesion and keratitis.

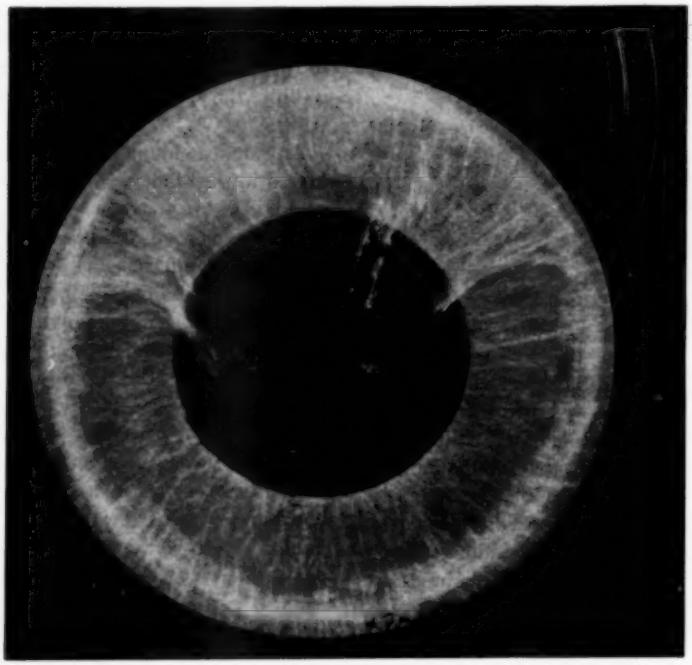

Fig. 8 (Hogan). *Case 2.* Gerontoxonlike lesion inside limbus and corneal infiltration.

life. He had also probably suffered from hay fever during childhood. The skin condition had undergone many exacerbations and remissions. Extensive studies were made by pediatricians and internists in an effort to determine the cause of this condition. He had

Fig. 9 (Hogan). *Case 3.* Atopic eczema with keratoconjunctivitis.

been treated with filtered X rays and a number of antihistaminic drugs, without improvement.

The first ocular symptoms appeared in 1940 when he was 26 years of age. At that time a bilateral inflammation of the conjunctiva and cornea occurred, accompanied by ulceration. After a considerable period the lesions subsided, leaving a residual impairment of vision. Constant relapses of the skin, conjunctival, and corneal inflammation occurred between 1940 and 1950, when he was first observed.

Present illness. He was first examined on April 20, 1950, when he complained of photophobia, discomfort, and slight discharge for the previous two months. Local astringent medications had not afforded relief.

Examination showed a slight pseudoptosis. Corrected visual acuity in the right eye measured 20/100 and in the left eye 20/50. The skin of the lids and face was thickened, fissured, and showed small weeping areas, especially at the external canthi (fig. 9). A fair amount of lichenification was present.

The palpebral and bulbar conjunctivas were hypertrophic and congested. The corneas showed a bilateral superficial inflam-

mation with scarring and vascularization, especially in the right eye (fig. 10). The principal lesions lay in the superficial third of the cornea.

In the right eye, the opacification extended into the pupillary region. There was no intraocular inflammation and the tension was normal. The lenses showed no cataractous changes.

Cultures showed a moderate number of pathogenic staphylococci, and scrapings showed one to two eosinophils per high-

Fig. 10 (Hogan). *Case 3.* Right eye. Corneal scarring and vascularization in atopic keratoconjunctivitis.

power field. There was faint staining of the corneas of both eyes with fluorescein, especially in the lower third. The eyes were treated with various antibiotics and astringents and the condition gradually subsided over a period of one month.

A relapse occurred again on August 3, 1951, at which time examination showed the condition to be much as has been described before. His eyes were treated with cortisone acetate suspension, diluted 50 percent with one-eighth percent methylcellulose solution, one drop every hour. Within four days all itching was gone and the secretion had markedly diminished. Both eyes appeared very much less inflamed.

By August 10th the itching was completely gone and both eyes showed only slight hyperemia. There was no staining of the corneas. Cultures still showed a few pathogenic staphylococci. On August 15th he was asymptomatic and visual acuity in the right eye was 20/70 and in the left eye 20/40. He was again seen on September 4th, at which time there was a complete remission of all symptoms and an absence of any sign of inflammation. Since this time he has continued the use of cortisone drops four times a day and has shown no tendency to relapse.

CASE 4.

A white man, an army officer, age 29 years, was first seen at Letterman Army Hospital on April 1, 1952, and I am indebted to Lieut. Col. Ozment for permission to publish the findings in this case.

Chief complaint. Watering, burning, and itching of both eyes since May, 1951. Dermatitis of the upper body since April, 1951.

Past history. As an infant he had a sensitive skin but he did not know of a definite eczema. His mother had a seasonal type of hay fever. He developed a mild dermatitis of the anterior portion of the neck between the ages of 16 and 20 which he attributed to close shaving.

Present illness. In May, 1951, while he was in Korea, there developed an erythematous weeping eczematoid eruption of the eyelids which progressed to involve the face, neck, and antecubital areas. Since that time the dermatitis had relapsed several times, especially when he was nervous. During his service in Korea he noticed an asthmatic type of wheezing which seemed to be worse during the evening periods.

During May to June, 1951, he noted that the eyes appeared to be irritated by dust. Examination at that time showed a pannus-like lesion which was present at the upper limbus in both eyes, more marked on the left.

In September, 1951, he was again examined at which time the condition had progressed. Both eyes were red, inflamed, and itching, especially the left eye. Examination showed a pannuslike lesion superiorly in both eyes composed of vessels and a gray infiltrate in the superficial corneal stroma. Several tiny staining ulcers were present in the limbal area. A dermatitis with thickening of the lids was present. At this time a dermatologist had made a diagnosis of an atopic dermatitis.

The patient was received at Letterman Army Hospital on April 1, 1952. Examination showed that he had an erythematous eruption with mild to marked lichenification on the skin of the face, neck, arms, upper chest, and back, antecubital spaces, and a

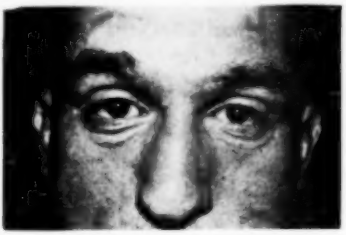

Fig. 11 (Hogan). *Case 4.* Atopic eczema of eyelids and face.

small area in the left popliteal space. There was thickening of the upper and lower eyelids with excoriation of the lower lids and inner canthal areas (fig. 11). The conjunctiva was inflamed and somewhat thickened. There was a pannuslike lesion in the superior and temporal limbus of both eyes (figs. 12 and 13).

Vision in the right eye was 20/30 and in the left eye was 20/25. After dilatation of the pupils, the lenses showed some early subcapsular changes in each eye. Laboratory studies were negative except for the hemogram which showed an 11-percent eosinophilia.

Fig. 12 (Hogan). *Case 4.* Corneal scarring in atopic keratoconjunctivitis.

The eyes were treated with cortisone acetate suspension, 1:4 dilution, every two hours. Marked improvement was noted objectively and subjectively.

On April 6, 1952, he developed a severe

Fig. 13 (Hogan). *Case 4.* Limbal scarring and vascularization in atopic keratoconjunctivitis.

attack of asthma which gradually became worse for several days and responded eventually to aminophyllin, adrenalinlike compounds, and barbiturates. The dermatitis gradually improved.

Complete studies in the allergy clinic including skin tests showed the patient to be positive only to house dust. It was not considered advisable to attempt desensitization.

Cultures of the eyes on April 17, 1952, showed many colonies of hemolytic, mannitol-positive Staphylococcus aureus in both eyes. Scrapings showed a few polymorphonuclear leukocytes, staphylococci, and an occasional eosinophil in each high-powered field. The patient was continued on topical cortisone every two hours and from an ocular standpoint remained symptom-free and showed no sign of progression of the vascularizing corneal lesion.

CASE 5.

A Chinese schoolboy, aged six and one-half years, had blurring of vision for one month; red, inflamed eyes for two years.

Past history. The patient had an infantile eczema which failed to respond to treatment. For two years he had suffered from asthma and a rhinitis. The eyes had always been slightly watery, hyperemic, and itchy.

Family history. There was no history of familial allergies.

Present illness. The vision had been found to be poor at school and an examination was recommended. The watering, itching, and congestion of the eyes had continued with

slight exacerbations for several years.

Examination. Vision in the right eye was 20/70 and in the left eye 20/70. There was a typical atopic eczema of the skin of the lids. The conjunctivas were slightly congested, without discharge. The corneas were somewhat hazy and attempted examination caused photophobia and tearing.

Corneal microscope and slitlamp examination showed a large number of fine gray epithelial infiltrates scattered over both corneas. Some of the infiltrates were stained with fluorescein. There was peripheral vascularization of the corneas in an irregular fashion for one to two mm., with some opacification of the stroma of the right eye in the upper outer quandrant.

Cultures showed pathogenic staphylococci on the lids, but none in the conjunctival sac. Conjunctival scrapings showed a few polymorphonuclear leukocytes, occasional staphylococci, and no eosinophiles.

Refraction. O.D., +1.75D. sph. ⌒ +1.0D. cyl. ax. 80° = 20/40; O.S., +1.5D. sph. ⌒ +1.0D. cyl. ax. 100° = 20/40.

Physical examination showed an extensive atopic eczema of the skin of the face, ears, neck, and chest. The skin was thickened, scaly, and thrown into numerous fine folds. A blood eosinophilia of four percent was present. Scratch and intracutaneous tests showed numerous positive reactions to foods, house dust, and pollens. It was not considered advisable to attempt desensitization.

Treatment. Topical cortisone acetate suspension diluted 1:4 with normal saline was ordered to be used every hour in each eye.

Course. Subjective and objective improvement was noted within three days. Since this time the eyes have been continuously normal and the epithelial infiltrates have disappeared. The peripheral vascularization persists.

Discussion

It is evident from these descriptions that the keratoconjunctivitis is a specific entity and is definitely related to the atopic eczema. As criteria to establish the diagnosis of this form of keratoconjunctivitis the following are considered essential:

1. Typical cutaneous changes consisting of persistent and symmetrically disturbed areas of chronic inflammation of the sides and back of the neck, face, axillae, shoulders, thorax, antecubital, and popliteal areas. The dermis is thickened and scaly and the skin folds are exaggerated. The eczema comes on early in life, persists for years, and is subject to exacerbations and remissions. Itching is severe during exacerbations.

2. A hereditary allergic tendency is exhibited in most cases.

3. Associated allergies such as hay fever, rhinitis, asthma, and urticaria are very frequent. Very commonly the patient gives a history of severe infantile eczema which may subside, or persist through childhood into adult life as an atopic eczema.

4. A keratoconjunctivitis, associated with exacerbations of the skin condition and characterized by hyperemia and thickening of the bulbar and palpebral conjunctiva and superficial infiltration and haziness of the peripheral cornea. Vascularization of the corneal stroma follows each attack. Any portion of the cornea may become affected, and in severe cases the entire cornea may become scarred and vascularized.

5. Laboratory investigations show an eosinophilia in the blood, especially during the active phases of the disease. An eosinophilia is also found in other exudates, including the conjunctival secretions. Positive intracutaneous and scratch tests of the "immediate type" to a number of antigens are usually found. Patch tests are usually negative.

If these criteria are accepted one is not likely to confuse the conjunctival and corneal changes associated with other dermatoses with those of atopic eczema. The cutaneous changes of acne rosacea are typical, and are restricted to the face. The condition is unassociated with allergy or allergic diseases. The keratoconjunctivitis is characterized by exacerbations and remissions and the periph-

eral cornea is principally affected. Eosinophilia in the blood or conjunctival secretions is not found.

Infectious eczematoid dermatitis is associated with a keratoconjunctivitis which is usually of an infectious type. Cultures of the lids and conjunctiva are almost constantly positive, usually for staphylococci. An eosinophilia is not found. The cornea is usually involved as a result of infection by staphylococci or the action of staphylococcus toxin with formation of peripheral catarrhal infiltrates or ulcers which lead to secondary vascularization.

Phlyctenulosis of the conjunctiva and cornea is commonly associated with this form of dermatitis. When the phlyctenules affect the cornea the condition is frequently referred to as eczematous keratitis which should not be confused with atopic keratitis. Catarrhal ulcers or infiltrates may occur during the course of atopic keratoconjunctivitis, but when they appear they are clearly differentiated from the primary disease.

Corneal lesions similar to those described heretofore have never been seen in seborrheic dermatitis.

The first four cases in this report show the features of a typical atopic eczema with a keratoconjunctivitis. The fifth case is presented because we feel that it showed: (a) the transition of infantile eczema into adult atopic eczema, and (b) the early corneal changes characteristic of this condition. The cutaneous changes in all cases were characteristic as to form and distribution and were persistent, with exacerbations and remissions. A hereditary tendency was exhibited by two of the cases. Two cases commenced with an infantile eczema which continued into adult life and three cases showed associated allergies, such as asthma and hay fever.

An eosinophilia was formed in the conjunctival secretion in three cases, and in the blood in two cases. Most of the cases showed numerous positive intracutaneous or scratch tests to various antigens, but the allergists or dermatologists did not feel that desensitization would be of value.

Pathogenic staphylococci were cultured from the lids and conjunctivas of the first four cases reported. The organisms were considered as incidental pathogens, however, since the lesions encountered in the corneas were not typical of those due to staphylococci or staphylococcus toxin. In Case 1 the organisms could not be eradicated from the conjunctiva but after parenteral cortisone therapy, and subsidence of the inflammatory signs, they were easily eliminated by antibiotics.

All the cases presented responded rapidly and effectually to topical or parenteral cortisone. In two cases when treatment was discontinued the disease remained in a state of remission. These findings corroborate the studies of Farber and Walton[6] and of Sternberg and his co-workers[7] on atopic eczema.

Case 1 is of interest in that the conjunctival and corneal inflammation gradually became refractory to topical cortisone, but responded immediately to hydrocortisone (compound F).

Only one case (Case 4) showed lenticular changes.

Summary and Conclusions

1. Five cases of atopic eczema with a keratoconjunctivitis are presented.

2. Atopic keratoconjunctivitis is a specific entity and the diagnosis is based on the following findings:

a. A hereditary history of allergies.

b. Associated allergies, such as asthma, hay fever, rhinitis, urticaria, and infantile eczema.

c. A typical persistent dermatitis affecting the face, neck, shoulders, axillae, thorax, popliteal, and antecubital areas. Exacerbations and remissions over a period of years are characteristic.

d. A keratoconjunctivitis, associated with activity of the skin condition and characterized by thickening and hyperemia of the con-

junctiva and opacification and vascularization of the cornea.

e. An eosinophilia in the blood and in the conjunctival secretion.

3. A prompt response to treatment with cortisone orally or topically occurred in all cases.

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THE OCCURRENCE OF INCLUSION BODIES IN THE EPITHELIUM OF THE NASAL AND URETHRAL MUCOUS MEMBRANES OF TRACHOMATOUS PATIENTS*

A PRELIMINARY REPORT

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Inclusion bodies have, so far, been described only in the conjunctival epithelium of trachomatous patients. The occurrence, in the same patients, of morphologically identical inclusions in epithelial scrapings from the nasal and urethral mucous membranes has hitherto not been recorded. The purpose of this paper is to report the results of a survey carried out to determine the presence and incidence of trachomalike inclusion bodies in nasal and urethral scrapings of persons who live in localities in which trachoma is known to be endemic.

Inclusion bodies of trachoma

Since 1907, when Prowazek and Halberstaedter discovered them, the nature and etiologic role of trachoma bodies have been the subject of considerable debate.

Although some authors[1, 2] do not accept these structures as virus bodies, recent work by Thygeson,[3] Poleff,[4] Cuenod and Nataf,[5] and Foley and Parrot[6] support the contention that the inclusion bodies of trachoma represent a living virus beyond any possible doubt.

The inclusion bodies of trachoma (which have many features in common with inclusions of psittacosis, inclusion conjunctivitis, and lymphogranuloma) undergo a series of distinctive changes in the process of their development. Their principal evolutionary forms (initial and elementary bodies) are differentiated by their size and color affinities.

Initial bodies are regarded as the primary forms of the virus from which the elementary bodies are developed. They are intracytoplasmic, rounded, sharply defined bodies measuring about 0.6 to 1.0μ in diameter.

As growth proceeds, minute elementary bodies, about 0.25μ in size, begin to replace

* Presented at the weekly staff meeting of the Department of Ophthalmology, American University of Beirut.

the initial bodies, the process starting in those occupying the middle of the inclusion body mass, so that, after a time, the center of the inclusion mass becomes filled with elementary bodies, and only a few initial bodies remain at the periphery of the cell. Later, elementary bodies begin to replace the marginal initial bodies, until a stage is reached when elementary bodies alone are observed in the cell.

The color of these various forms depends on the stain used and will be discussed presently.

Material investigated

The majority of patients examined were school children living in areas in which trachoma is highly endemic. Their ages ranged from four to 12 years. Some came from the out-patient department of the University Hospital. A preliminary clinical examination was performed to determine the presence or absence of trachoma, after which conjunctival, nasal, and urethral scrapings were obtained for examination.

These patients can be grouped as follows:

Group I. Patients with clinical evidence of trachoma.

Group II. Patients with no clinical evidence of trachoma but with some other ocular disease.

Group III. Persons with clinically normal eyes.

Method of obtaining specimens

1. Conjunctiva

The eyes were anesthetized by applying a 0.5-percent solution of tetracaine hydrochloride into the conjunctival sac twice at intervals of about three minutes.

The upper eyelid was then everted and, at the same time, pressure was applied over the lower lid to expose the upper fornical conjunctiva. The conjunctival surface was then freed from exudate by washing with normal saline solution. Finally, the conjunctival surface was scraped with a single stroke of a celluloid cover class, care being taken not to cause any bleeding.

The celluloid cover glass was then placed on a clean glass slide and the epithelial scrapings spread evenly over the latter's surface, after the usual manner of preparing a blood film.

The celluloid cover glass should measure 5.0 mm. by 15 mm. and its corners should be rounded off with scissors, to avoid injury to the conjunctiva. It is used once and discarded.

2. Nose

One side of the nose, usually the right, was sprayed with a two-percent solution of tetracaine hydrochloride. A few minutes were allowed to elapse for the anesthetic to act, after which, if necessary, the anterior portion of the inferior turbinate was cleaned with a cotton swab. An ordinary, semisharp ear-wax curette was then introduced into the nose to a depth of one inch and the inferior turbinate gently scraped from behind forward. The scrapings obtained were placed on a glass slide and spread evenly over its surface with the aid of another slide.

3. Urethra

The tip of an eyedropper containing about 0.5 cc. of a two-percent tetracaine hydrochloride solution was inserted into the urethra and the solution injected. Time was allowed for the anesthetic to act (usually two to three minutes), after which a semisharp ear wax curette was introduced to a depth of one inch up the urethra, and the latter gently scraped from behind forward. There usually followed some bleeding so that immediate repetition of the procedure was not possible when the first attempt had failed. In such cases a second attempt was made six to 12 hours later and a blood-free specimen was procured.

Staining methods

In this investigation two methods of staining were employed, namely, the classical Giemsa stain, and another described by Poleff[7] and called "staining by citrate methy-

lene blue." The two techniques will now be briefly described:

A. GIEMSA STAIN

1. Fixation by methyl alcohol for three minutes.

2. Immersion in a freshly prepared 1:20 Giemsa solution for 30 minutes.

3. Rinsing with ordinary water.

When this stain is used, initial bodies stain dark blue, whereas elementary bodies stain red.

B. POLEFF STAIN

1. Fixation by flame.

2. Staining for three minutes in a mixture of 1.0 gm. of methylene blue and of 0.50 gm. of citric acid in 100 cc. of distilled water.

3. Rinsing with ordinary water.

As Poleff points out, this technique provides a perfect contrast between inclusion bodies, which stain purple with a violet tinge, and their background, which takes a clear sky-blue color. The method is simple, rapid, and permits of easy and certain identification of trachoma bodies.

The present study has amply corroborated the claims of Poleff. Of the specimens known to be positive for inclusion bodies when treated with the Poleff stain, only 27 percent were positive when the Giemsa stain was used. The method therefore presents great advantages over older straining methods and should be recommended.

READING OF RESULTS

A slide was considered to be negative when, after a search of 20 to 30 minutes, no trachoma bodies could be found. It is possible that search beyond this period, especially in scrapings from clinically certain trachoma cases, might have shown inclusion bodies in some of these slides.

Poorly prepared smears, which are unavoidable when dealing with a large number of cases at one time, were also reported negative.

TABLE 1

CLINICAL DIAGNOSIS IN A SURVEY OF 137 PATIENTS

No. of Patients Examined	Diagnosis
112	Trachoma
2	Vernal conjunctivitis
2	Blepharitis
2	Chronic dacryocystitis
1	Squint
1	Pterygium
3	Koch-Weeks conjunctivitis
1	Morax-Axenfeld conjunctivitis
13	Normal eyes

FINDINGS

In all, 137 persons (mainly children) were examined. Of these, 112 showed definite trachoma; 12 had various ocular complaints other than trachoma; in 13, the eyes were entirely normal (table 1).

GROUP I

Trachoma patients. Out of the 112 certain cases of trachoma, 94 (83.9 percent) were bearers of trachoma bodies in their conjunctival sacs (O.D., O.S., or both); 54 (48.2 percent) showed trachoma bodies in their nasal scrapings; and 16 (14.2 percent) showed trachoma bodies in the urethra (table 2).

In general, therefore, it appears that the incidence of inclusion bodies in cases of trachoma is highest in the conjunctiva, less so in the nose, and lowest in the urethra.

Table 3 correlates the distribution of trachoma bodies in the tissues of these patients:

TABLE 2

INCIDENCE OF INCLUSION BODIES IN THE TISSUES OF 112 TRACHOMA PATIENTS

No. of Patients Examined	No. of Patients with Positive Eye Scrapings	No. of Patients with Positive Nasal Scrapings	No. of Patients with Positive Urethral Scrapings
112	94 (83.9)	54 (48.2%)	16 (14.2%)

TABLE 3

DISTRIBUTION OF INCLUSION BODIES IN THE TISSUES OF 112 TRACHOMA PATIENTS

No. of Patients	Percent of Total	Presence of Conjunctival Inclusions	Presence of Nasal Inclusions	Presence of Urethral Inclusions
45	40.1	+	−	−
5	4.4	−	+	−
33	29.4	+	+	−
16	14.2	+	+	+
13	11.6	−	−	−

45 (40.1 percent) were bearers of inclusion bodies only in their conjunctival sacs; five (4.4 percent) showed inclusion bodies only in their nasal epithelium; 33 (29.4 percent) showed inclusion bodies in both their conjunctival and nasal epithelium; 16 (14.2 percent) revealed inclusion bodies in their conjunctival, nasal, and urethral epithelium; 13 (11.6 percent) showed no inclusion bodies at all.

It is a well-known fact that the inclusion bodies found within the epithelial cells of the conjunctiva are most numerous during the early stages of trachoma, but as the condition progresses they become less frequent. This decrement in the incidence of inclusion bodies in the later phases of ocular trachoma is well shown in Table 4.

The same tendency is apparent, although less clearly, in nasal trachoma. Although from the present statistics urethral trachoma does not seem to follow this rule, the small number of patients examined does not permit final conclusions to be drawn regarding this issue.

GROUP II

Patients presenting ocular complaints other than trachoma. Of these 12 patients, four, (33.3 percent) were bearers of inclusion bodies in their conjunctival epithelium and one (8.3 percent) showed inclusion bodies in his nasal epithelium. All of the urethral scrapings taken from this group, however, were negative (table 5).

GROUP III

Healthy subjects. This group consisted of 13 healthy school children in intimate contact with trachoma patients. They had normal conjunctivas. One (7.6 percent) showed inclusion bodies in both his conjunctival and nasal epithelium, one (7.6 percent) showed inclusion bodies only in his nasal epithelium, while four (30.7 percent) showed inclusion bodies only in their conjunctival epithelium. Urethral scrapings were all negative (table 6).

From an epidemiologic point of view, Groups II and III were most instructive. Since these patients presented no clinical signs of trachoma whatsoever (sago grains, pannus, scarring), the presence of inclusion bodies in the superficial epithelium of their conjunctival and nasal mucous membranes should be considered objective proof of their role as carriers of trachoma infection.

TABLE 4

DISTRIBUTION OF INCLUSION BODIES IN THE VARIOUS STAGES OF TRACHOMA

Stage of Trachoma (MacCallan)	No. of Patients Examined	Positive Conjunctival Scrapings	Positive Nasal Scrapings	Positive Urethral Scrapings
I	53	53 (100%)	25 (46.6%)	6 (11.3%)
II	15	12 (80%)	11 (73.3%)	2 (13.3%)
III	33	25 (75.7%)	14 (42.4%)	4 (12.1%)
IV	11	4 (36.3%)	4 (36.3%)	4 (36.3%)

TABLE 5

INCIDENCE AND DISTRIBUTION OF INCLUSION BODIES IN PATIENTS PRESENTING OCULAR COMPLAINTS OTHER THAN TRACHOMA

No. of Patients Examined	Diagnosis	No. of Patients with Positive Conjunctival Scrapings	No. of Patients with Positive Nasal Scrapings	No. of Patients with Positive Urethral Scrapings
2	Vernal catarrh	1	0	0
2	Blepharitis	1	0	0
2	Dacryocystitis	0	1	0
1	Squint	0	0	0
1	Pterygium	0	0	0
3	Koch-Weeks conjunctivitis	1	0	0
1	Morax-Axenfeld conjunctivitis	1	0	0

No inclusion bodies were found in the urethral scrapings of nontrachomatous patients (Groups II and III). It is possible however, that viroscopic examination of a larger number of patients may reveal some to carry inclusions in the urethra, thus establishing the latter's role as a reservoir of trachoma inclusions.

DISCUSSION

The results of this investigation modify our concept of trachoma, which, so far, has been built on the assumption that inclusion bodies occur only in the conjunctivas of those affected with the disease. The following are some of the problems which need to be considered:

1. *The nature of trachoma.* Trachoma has been considered a disease strictly localized to the conjunctiva, and only in rare instances extended to the lacrimal sac of affected patients. That this is not necessarily so must seriously be considered.

a. *Trachoma of the nose.* Of the 54 patients in whom inclusion bodies were found in the nose, 39 (72.2 percent) had mucopurulent nasal discharge. The nasal mucosa was congested. Fissures in the vestibule and around the external nares were frequently observed. Many patients volunteered the information that their nasal and ocular symptoms had started at the same time.

It seems justifiable, therefore, on the basis of clinical and microscopic evidence to conclude that the nasal symptoms were actually due to invasion of the nose by the virus of trachoma. It is suggested that the term "trachomatous" or "inclusion rhinitis" be employed to designate this affection.

b. *Trachoma of the urethra.* The presence of inclusion bodies in the urethra of 16 patients is ample evidence that a trachomatous urethritis exists. Frank urethritis, however, as evidenced by discharge, swelling, and redness of the urethral mucosa, was not observed. In spite of that, I am of the opinion that such cases do exist, and may be discovered if a larger number of patients were to be examined.

Failure to detect such cases, which, like trachoma infection in general, are presumably mild, may also be due to the difficulty of examining the urethral mucous membrane, and the inability of children to give an adequate history.

It is possible that inclusion bodies may also be found in the vagina and cervix of the female if a sufficiently large number of trachoma patients is examined. Obtaining

TABLE 6

INCIDENCE AND DISTRIBUTION OF INCLUSION BODIES IN HEALTHY INDIVIDUALS

No. of Persons Examined	Conjunctival Scrapings	Nasal Scrapings	Urethral Scrapings
1	+	+	−
1	−	+	−
4	+	−	−
7	−	−	−

suitable specimens on a large scale, however, presents certain obvious difficulties and, in the case of children, is entirely impossible.

2. *Relationship of trachoma to inclusion blennorrhea.* It is well known that the virus of inclusion blennorrhea is responsible for certain types of urethritis[9-11] and for infection of the upper respiratory passages.[12-14] So far, however, the lack of evidence that a similar variety of infective urethritis and rhinitis occurs in connection with trachoma, or in countries in which the incidence of trachoma is high, has prevented the universal acceptance of Lindner's theory[15] that the two diseases are identical.

The results of this investigation have proved that, among trachoma patients, infection of the respiratory and genital tracts is quite prevalent. There remains little doubt, therefore, that the etiologic agents of trachoma and inclusion blennorrhea are very closely related, if not altogether identical.

3. *Transmission of trachoma.* It is generally agreed that the virus of trachoma is transmitted in the conjunctival secretions of patients affected with the disease. Since 48.2 percent of the patients examined showed trachoma bodies in the nose, the importance of transmission by droplet infection (through sneezing) should not be overlooked.

Likewise, the presence of trachoma bodies in the genital tract of some patients with trachoma suggests that trachoma may, in some cases, be transmitted from person to person by sexual intercourse. Transmission of infection from the genitalia to the eyes and vice versa (as in gonorrhea), may also occur.

Trachoma may also be acquired at birth from the infected genital passages of the mother.

4. *Trachoma carriers.* Among 25 subjects free from trachoma (Groups II and III), 11 (44 percent) were shown to be carriers of inclusion bodies in their eyes or nose. It is significant that in two of these patients, inclusion bodies were found only in the nose.

If it is conceded that inclusion bodies are diagnostic of trachoma, these findings suggest the existence of conjunctival and nasal carriers of trachoma infection among apparently healthy individuals with no symptoms of disease.

5. *Therapy in trachoma.* Since trachoma appears to be a generalized infection, involving the eyes, nose, and urethra of affected patients, the futility of any type of local therapy directed to the conjunctiva alone is obvious. Failure of modern chemotherapeutic and antibiotic agents to control trachoma when applied to the conjunctival sac may be due to the fact that the latter is continually being reinfected from the nose and the urethra.

Treatment of trachoma, therefore, should be directed against the respiratory and genital tracts as well as the eyes. Since local treatment of the nose and urethra is technically difficult, it seems likely that the ideal therapeutic agent in trachoma will prove to be one given internally and exerting a systemic action throughout the tissues of the body.

Case reports

Case 1

R. M., a 52-year-old man, and otherwise in good health, was referred to me by Dr. A.

Fig. 1 (Abu-Jaudeh). Elementary bodies of trachoma filling the cytoplasm of an infected conjunctival cell. (Poleff stain.)

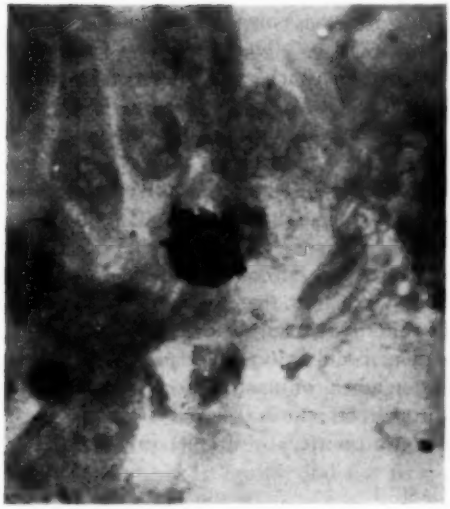

Fig. 2 (Abu-Jaudeh). A parasitized nasal epithelial cell showing elementary and initial body forms. (Poleff stain.)

Baghdassarian on November 26, 1952, complaining of pain, redness, and diminished vision, O.S., of three days' duration. At the same time he had started a "head cold." Previously he had been treated for trachoma by Knapp's expression and a prolonged course of silver-nitrate applications.

Examination revealed: The left eye showed marked blepharospasm, redness, thickening and velvety appearance of the palpebral conjunctiva, injection of the bulbar conjunctiva, pannus 4.0 to 5.0-mm. wide, normal iris, and fundus. Vision was 20/40. The right eye showed scarring of the palpebral conjunctiva and a regressive pannus 3.0 to 4.0-mm. wide. Vision was 20/30.

The nasal mucosa was congested and there was some mucopurulent nasal discharge. There was no urethral discharge or burning on urination.

Cultures from both eyes were negative. Trachoma bodies were found in both conjunctival sacs, in the nose, and in the urethra (figs. 1, 2, and 3).

Undoubtedly this patient has had trachoma for a long time. Scarring could not be detected in the left eye on account of the extreme injection of the palpebral conjunctiva.

This case illustrates several points:

1. A fresh exacerbation or reinfection of the conjunctiva with the trachoma virus has occurred. Reinfection may have been autogenous, that is, from the patient's nose or urethra, which were very rich in trachoma bodies, or through contact with a trachoma patient.

2. The "head cold" together with the presence of inclusion bodies in the nose represented an inclusion or trachomatous rhinitis.

3. Although the right eye showed no signs of trachoma activity (healed trachoma), it was rich in inclusion bodies.

4. Urethral scrapings were rich in inclusion bodies, but there was no evidence of clinical urethritis.

Case 2

F. A., (Hospital No. 74081) a six-year-old girl complained of photophobia, itching, and slight discharge and redness of her eyes.

Examination revealed the presence of fol-

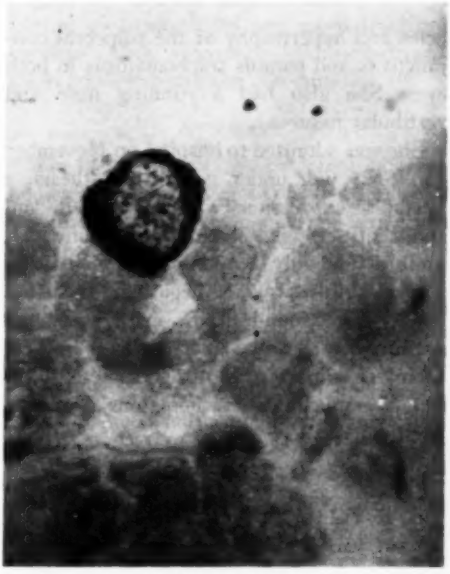

Fig. 3 (Abu-Jaudeh). Epithelial cell from the urethral mucous membrane packed with elementary bodies. (Poleff stain.)

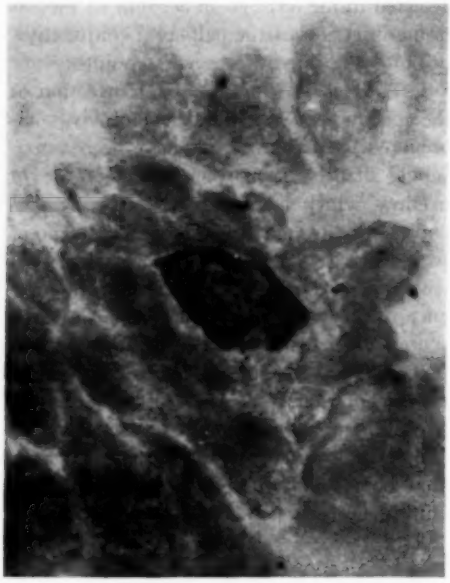

Fig. 4 (Abu-Jaudeh). An epithelial cell from the nasal mucous membrane filled with elementary bodies. Note the contrast between the parasitized cell and the normal cells surrounding it. (Poleff stain.)

licles and hypertrophy of the palpebral conjunctivas and pannus trachomatosus in both eyes. She also had a running nose and vestibular fissures.

She was admitted to hospital on November 13, 1952, and, under general anesthesia, a Knapp's expression was performed and epithelial scrapings from the conjunctivas, urethra (and vulva), and nose were obtained.

Eye cultures were negative. Inclusion bodies were found in the eyes, nose, and urethra (figs. 4 and 5). Diagnosis: (1) Trachoma II both eyes; (2) trachomatous rhinitis; (3) subclinical trachomatous urethritis (and vulvitis).

CASE 3

A. R. (O.P.D. No. 122740), a seven-year-old girl, was seen on December 8, 1952, complaining of itching, lacrimation, and photophobia for four months.

Examination revealed follicles and hypertrophy of the palpebral conjunctivas and pannus 2.0 to 3.0-mm. wide. Visual acuity was 20/20 in each eye. There was no nasal discharge.

Conjunctival and nasal scrapings were very rich in inclusion bodies (fig. 6). Urethral scrapings were negative. Diagnosis: (1) Trachoma II, both eyes; (2) subclinical inclusion rhinitis.

In this case, although the nose was rich in inclusion bodies, there were no clinical signs of rhinitis. It is suggested, however, that this patient could infect other persons not only through her conjunctival secretions, but also through secretions derived from her nose and transmitted by droplet infection.

CASE 4

D. R., a five-year-old schoolboy, with no complaints, was examined at school on February 2, 1953. He showed typical trachoma II (follicles and hypertrophy), but his nose was clean. Conjunctival scrapings were negative for inclusion bodies, but nasal scrapings were richly positive. Urethral scrapings were negative.

This case demonstrates the fact that in patients with trachoma, inclusion bodies may

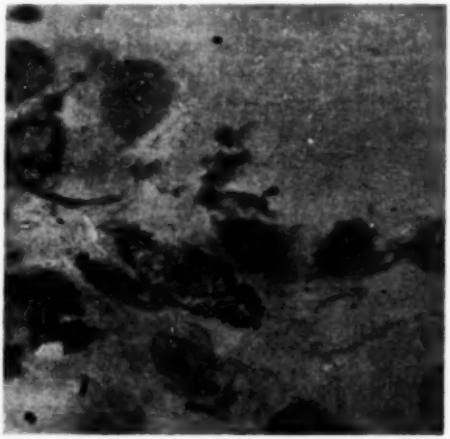

Fig. 5 (Abu-Jaudeh). Epithelial cell from the vulva of a six-year-old trachomatous patient (Case 2). (Poleff stain.)

be found in the nose when they are absent in the eyes themselves. These findings occurred only five times among the 112 trachoma patients examined.

CASE 5

B. D., a seven-year-old boy, was seen during a routine survey of his school on February 2, 1953. The eyes appeared normal except for mild scaling and redness of his lid edges.

The nose was normal, and so was the urethra. Diagnosis: Blepharitis. Viroscopic examination was positive for inclusions in the nose and negative in the eyes and urethra.

This case establishes the existence of nasal trachoma carriers in healthy individuals.

CASE 6

R. A., an 11-year-old girl, was examined at school on January 10, 1953. The eyes and nose were normal. Viroscopic examination revealed inclusion bodies in the eyes and nose (fig. 7), but not in the urethra.

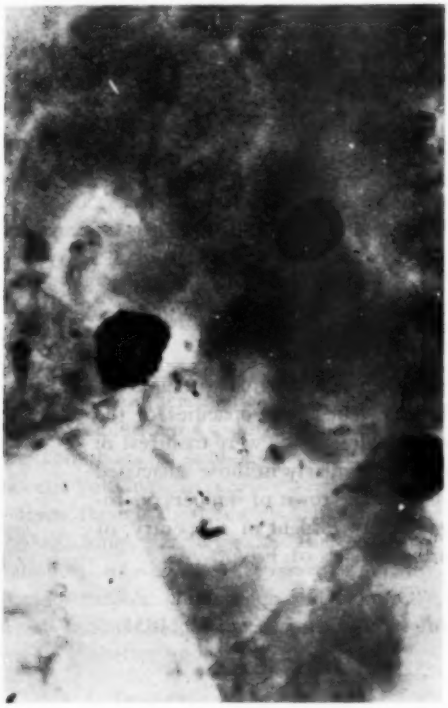

Fig. 6 (Abu-Jaudeh). Nasal scraping showing three inclusion bodies in an oil immersion field (Case 3). (Poleff stain).

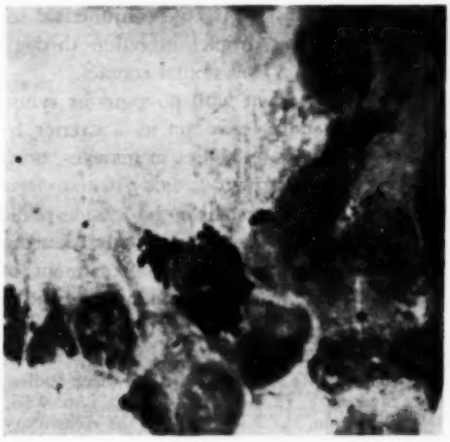

Fig. 7 (Abu-Jaudeh). An inclusion body in the nasal epithelium of a normal person (Poleff stain.)

This case is significant because it proves objectively and for the first time the existence of conjunctival and nasal trachoma carriers among apparently healthy individuals in trachoma-stricken communities.

SUMMARY

The incidence and distribution of inclusion bodies in the tissues of 137 patients inhabiting localities where trachoma is endemic have been presented.

Contrary to the accepted concept, trachoma is not a local disease of the conjunctiva, but rather a widespread affection involving most of the epithelial surfaces of the body.

On the basis of clinical and microscopic evidence, trachomatous rhinitis, and possibly urethritis, should be recognized as clinical entities.

The similar behavior of the viruses of trachoma and inclusion blennorrhea with respect to their distribution in the eyes, upper respiratory, and genital tracts is further evidence that the two viruses are identical.

Trachoma appears to be transmitted in

three ways: (1) by infected conjunctival secretions, (2) by droplet infection through sneezing, and (3) by sexual contact.

A healthy patient with no signs or symptoms of trachoma may act as a carrier by harboring trachoma bodies in his eyes, nose, or urethra.

Since trachoma seems to be a widespread infection, involving most of the mucous membranes of the body, the treatment of choice should be some form of medication given internally and exerting a systemic effect throughout the tissues of the body. Local treatment of the conjunctiva cannot be expected to effect a cure.

Six case histories with special features are presented.

American University Hospital.

I wish to express my appreciation to my wife, Sadie Whattam Abu-Jaudeh, for her helpful suggestions and coöperation in the preparation of this paper.

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Ophthalmic Miniature

The injurious effects of this disease (epidemic ophthalmia), in the form of complete loss of one eye, staphylomata, leucomata, opacities of the cornea of various shades, and chronic ophthalmia, etc., were manifest in a great number of people I encountered; particularly in those emaciated and broken down in health, whom I saw in the town of Tipperary. Indeed, I was strongly reminded during the day I spent in Tipperary, of scenes I witnessed many years ago in the bazaars of Egypt.

W. R. Wilde, "On epidemic ophthalmic . . ."
London Journal of Medicine, 1851.

THE SPECIFIC VASCULAR LESIONS OF DIABETES MELLITUS

II. Retinopathy and intercapillary glomerulosclerosis

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In previous studies of diabetic patients we came to the conclusion that atherosclerosis, medial (Mönckeberg's) sclerosis and arteriolar nephrosclerosis, while not pathognomonic of diabetes, nevertheless appear earlier in life, on the average, and at any given age are more advanced in this disease.[1, 2] Hence, several authors[3-5] have pointed out that, although diabetes has an accelerating effect on these three forms of arteriosclerosis, the conditions seem to be unaltered by either the severity of the disease or the nature of the treatment.

Advanced atherosclerosis and medial sclerosis, affecting particularly the large arteries, are commonly observed in the "mild (older) diabetic" patient, whereas only slight changes may be present in the large arteries of the "severe (younger) diabetic" patient.

In the present paper, I am concerned with the changes in the small vessels of the retina and glomerulus of diabetic patients; namely, diabetic retinopathy and intercapillary glomerulosclerosis. Because the large arteries are generally spared in the young diabetic patient, retinopathy and glomerulosclerosis may be studied in their pure form in this group.

Characteristic lesions develop in the small blood vessels of the retina and the glomerulus and these are totally unrelated to atherosclerosis and the other types of arteriosclerosis which complicate the differentiation of these two conditions in middle-aged and elderly diabetic patients.

Even though the diabetes may be severe and of long standing, the atherosclerotic complications which are seen most frequently in older diabetic patients—namely, coronary artery lesions and gangrene—are relatively rare in diabetics under 40 years of age.

A. Diabetic retinopathy

Although a few authors still refuse to recognize retinopathy as a distinct entity the large majority now accept the retinal lesions, which are not seen in similar form or distribution in any other disease, as being characteristic of diabetes. According to Duke-Elder[6] ophthalmologists were able to differentiate the retinal picture of diabetes from nephritic and other retinopathies even in the pre-insulin era and occasionally were the first to call attention to the existence of diabetes solely from their fundus examination.

Recently, McCulloch[7] reported a higher percentage of conjunctival capillary aneurysms in diabetics with retinopathy than in those without retinopathy. However, examination of various other organs from diabetic persons—brain, meninges, lungs, pleura, liver, peritoneum, and so forth—fails to reveal aneurysmal dilatations. Therefore, the capillary lesions of the retina are very likely specific for diabetes mellitus.

The typical retinal lesions in diabetes mellitus, usually designated "retinopathy," have been defined as "an abruptly developing involvement of the retina characterized by serous and hemorrhagic extravasation into and under the retina."[8a]

In 1,052 diabetic patients examined by Wagener and others, the incidence of retinal lesions revealed by ophthalmoscopic examination was 17.7 percent.[8b] The lesion was limited to hemorrhages in 5.5 percent of the cases and, in 12.2 percent, there was a combination of hemorrhages and exudates.

These figures correspond to those presented by Waite and Beetham from the Deaconess Hospital in Boston.[9]

In 1945, Wagener[10] stressed the increasing incidence of retinopathy which he now observed in 67 percent of the diabetic patients who had had the disease more than 15 years, and in 73 percent of those surviving 20 years

or more. These authors found retinopathy in 76 percent of patients under 30 years of age who had had diabetes for more than 10 years.

Retinal "hemorrhages" were reported in 80 percent of White and Waskow's juvenile diabetics after they had had the disease 20 years.[11]

Recently, Dolger[12] has emphasized the great frequency of retinopathy, pointing out, however, that the lesions are not peculiar to juveniles but occur as frequently in the adult. The earliest retinal changes were usually present about 13 years after the onset of diabetes in young and old alike.

While the incidence of diabetes in Denmark has been increasing twofold or threefold during the last 20 years, according to Vogelius, the incidence of diabetic retinopathy has increased even more rapidly.[13]

1. *Description of lesions in diabetic retinopathy (fundoscopic and pathologic).* Jaeger[14] described diabetic retinopathy shortly after the ophthalmoscope was introduced in 1856. In 1875, Leber[15] reported the pathologic changes in the retina with accompanying illustrations of the round punctate spots in the perimacular areas now so well known.

Although the damage may be insufficient in degree in some patients to bring about detectable abnormalities, in cases in which a visible abnormality is present in the retina a typical ophthalmoscopic picture is produced. According to one school of thought the earliest sign of diabetic retinopathy is venous dilation.

Mylius[16] was one of the first to direct attention to venous stasis in the capillary network of the retina. In this country Agatston was an early proponent of the venous stasis theory which he supported with histologic data.[17]

In a large series of diabetic retinas, studied microscopically, Bedell[18] reported degenerative lesions of the capillary loops, thickened walls, dilated lumens, intimal fibrosis and capillary hemorrhages, in addition to venous stasis.

The majority of the authors agree that the earliest stage of retinopathy consists of tiny, round, discrete, punctate lesions usually situated in the vicinity of dilated terminal venules in the macular and perimacular region (fig. 1-A). Thus, the only lesions which appear in the eyegrounds of patients whose diabetes is less than 10 years' duration are the small round ones. They are in nowise associated with the large retinal arteries and have no obvious correlation with sclerosis.

In 1876, MacKenzie[19] described microaneurysms in the retina of diabetic patients, both ophthalmoscopically and in fresh tissue.[20, 21] In 1943, Ballantyne[20] revived this concept of capillary telangiectases, or aneurysms, and suggested their specificity in diabetes.

Recent histologic studies of flat preparations also indicate that the earliest organic changes in the retina are actually punctate capillary microaneurysms. In contradistinction to the elongated, irregular hemorrhages of hypertensive and renal retinopathy, the diabetic aneurysms are round and uniform in size. The former are found in the middle layers of the retina, whereas the microaneurysms of diabetes are located in the inner nuclear layer, the overlying structures being elevated in such a manner as to produce a spherical or globoid picture.

In the fresh or stained specimen great numbers of aneurysms, many of which are invisible on funduscopic examination, can be identified. They vary in diameter from 30 to 60 microns, just within the limits of visual acuity.

Using a different technique, Ashton[21] confirmed MacKenzie's and Ballantyne's findings in serial sections of the retina, namely, that true globular aneurysms are produced by distention of the retinal capillary walls. Subsequently, this author demonstrated microaneurysms in a few nondiabetic conditions.[22]

As demonstrated by Sherrill[23] in a diabetic patient, in whom the lesions disappeared following the termination of a pregnancy, microaneurysms appear to be reversible. However, Givner[24] is one author who still

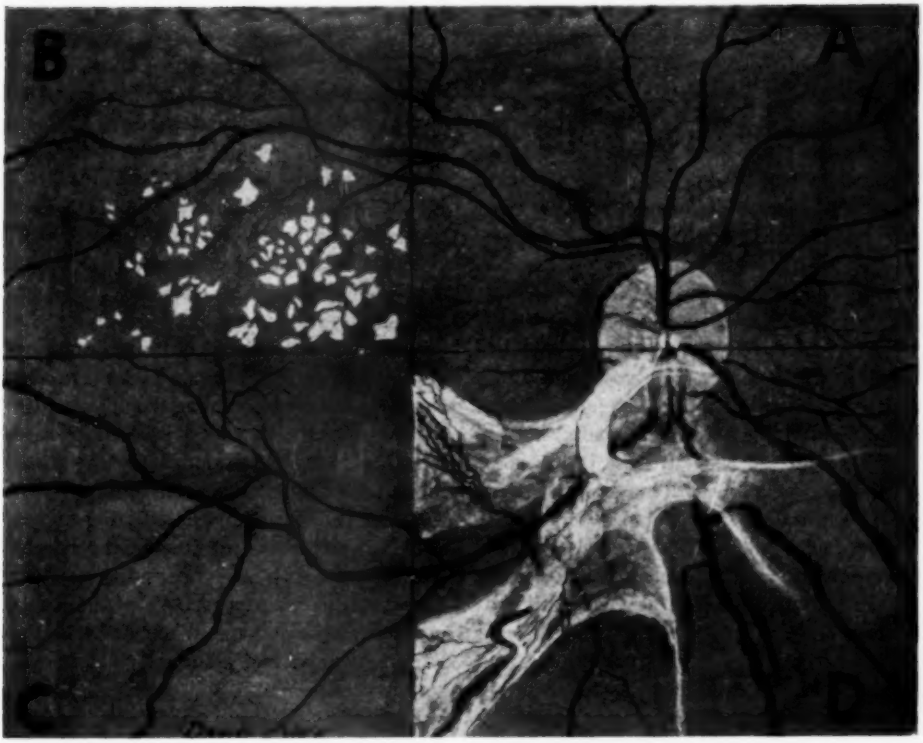

Fig. 1 (Goodman). Drawing of a hypothetical fundus, illustrating the types of defects which may be seen ophthalmoscopically in diabetic retinopathy.

Quadrant A shows numerous microaneurysms (punctate hemorrhages).

Quadrant B shows sharply demarcated, irregularly shaped, "hard," yellowish-white to white exudates.

Quadrant C shows aneurysmal variations and increase in venous caliber.

Quadrant D shows venous changes as in (C) and abundant fibrous tissue and new vessel formation involving the retina and vitreous body (retinitis proliferans), and two superficial flame-shaped hemorrhages.

Defects as in (A) may be the only type of lesion found. Defects as in (C) are usually associated with those of (A), although dilation of the larger retinal veins may be found as an isolated entity. Defects as in (B) are always associated with those of (A) and often with those of (C). Defects as in (D) are preceded and accompanied by the changes shown in (A), (B), and (C).

maintains that the majority of the pinpoint spots seen in retinopathy are not microaneurysms but true hemorrhages in the nuclear layer.

At a later, but still early, stage of retinopathy, and usually closely associated with the minute lesions just described, a few shiny, irregularly shaped punctate exudates are seen in the deeper layers of the retina, either above or below the fovea centralis. For this picture the term "central punctate retinitis" was coined by Hirschberg (fig. 1-B). In early retinopathy exudates take the same pinpoint form as the microaneurysms. Later, exudates may appear in any part of the retina, coalesce and, in long-standing cases, ultimately fuse into large, necrotic looking plaques in the macular region which seriously interfere with central vision.

As the disease progresses, definite hemorrhage may be produced, either by diapedesis of red cells through the endothelium of the aneurysmal wall, or by rupture of an aneurysm. In this stage the aneurysms may be

surrounded by a faint halo and finally replaced by a round scar. Usually exudates and flame-shaped hemorrhages do not appear until the duration of diabetes exceeds 10 years.

Wagener, Dry, and Wilder[8b] point out that, in advanced stages of retinopathy, marked abnormalities of the veins may be associated with large, widespread hemorrhages. The veins appear more or less uniformly dilated and cyanotic; some sections are ensheathed in a layer of heavy, grayish-yellow infiltration suggestive of mural thrombi while intervening sections of the vein appear to be obliterated (fig. 1-C).

In the final phase of retinopathy, hemorrhages appear in the vitreous, rather commonly in association with marked disease of the veins, and, as a result, proliferation of fibrous tissue and newly formed vessels takes place, giving rise to a picture resembling tuberculosis or syphilis termed "retinitis proliferans."

Ballantyne[25] depicts this condition as an "amazing regrowth of new vessels." Contraction of the bands of scar tissue may ultimately result in detachments of the retina (fig. 1-D), the most serious and rapidly progressive complication of retinopathy. As a consequence, vision is seriously impaired and blindness may result. Thus, diabetic retinopathy appears to pass through progressive stages, beginning with microaneurysms and pinpoint hemorrhages, and eventuating in gross venous pathology, hemorrhages into the vitreous, and proliferation of connective tissue.

B. Intercapillary glomerulosclerosis (Kimmelstiel-Wilson's syndrome)

In 1936, Kimmelstiel and Wilson[26] described a focal hyalin glomerular lesion of the kidney which they considered specific for diabetes. Before these investigations, clinical manifestations of nephrosis in a diabetic patient were considered as part of a chronic glomerulonephritis unrelated to the diabetes.

While the lesions of Kimmelstiel and Wilson have been reported occasionally in other diseases, they occur so rarely that now it is generally conceded that this condition is a distinctive entity occurring almost exclusively in diabetic patients. Allen,[27] for example, has stated: "I am altogether convinced of the specificity of the nodular lesions" (of Kimmelstiel and Wilson). Bell[28] likewise considers the lesion in the glomeruli, especially the large nodular lesions, almost pathognomonic for diabetes.

Recently, a remarkable correlation has been demonstrated between retinopathy and Kimmelstiel-Wilson's disease. Friedenwald[29] found innumerable retinal capillary aneurysms in every case of glomerulosclerosis which he studied leading him to suggest that the latter might be the renal counterpart of the same capillary disorder affecting the retina. Day and his co-workers[30] corroborated this hypothesis by demonstrating capillary aneurysms in flat preparations of the retinas in 25 cases having the Kimmelstiel-Wilson lesion. Ashton[21] had a similar experience in seven cases.

From these studies it appears that diabetic retinopathy and Kimmelstiel-Wilson's disease have several things in common pathologically: Capillary dilatation, localized degeneration, and proliferation of the vessel walls. There is a hyalin deposition in the intercapillary connective tissue of the kidney, on the one hand, and waxy exudates in the retina, on the other.

Retinal lesions apparently occur earlier than the renal lesions since retinopathy can be found in the absence of Kimmelstiel-Wilson's disease, but not vice versa. Thus Kimmelstiel and Porter[31] found retinopathy in 86 percent of their cases of intercapillary glomerulosclerosis and, had the retinas been examined microscopically using the latest techniques, in all probability would have found retinal lesions in all of them.

1. *Incidence of intercapillary glomerulosclerosis.* The optimism which sprang up immediately following the discovery of insulin regarding the prognosis of the diabetic pa-

tient has been modified considerably in recent years by the high incidence of kidney damage reported in diabetic children.

In surveys of autopsy material from various hospitals, estimates as to the incidence of Kimmelstiel-Wilson's lesions in diabetic patients range from 18 to 63 percent. The discrepancies in these figures would seem to be due largely to the failure of pathologists to agree as to the exact criteria for the anatomic diagnosis of this condition.

2. *Age incidence of intercapillary glomerulosclerosis.* Most of the earlier reports and some recent ones dealing with the Kimmelstiel-Wilson syndrome stress the mild character of the associated diabetes and its occurrence chiefly in middle and late life, most common in the sixth and seventh decades.[28, 32-40] It has been brought out recently, mainly through the investigations of Joslin and his associates, that these lesions are actually more frequent in young persons.

Kimmelstiel-Wilson's lesions were reported in three of 12 patients studied by Millard and Root[41] whose deaths occurred between 25 and 32 years of age. White and Waskow[11] found intercapillary glomerulosclerosis in all juvenile diabetics who died after 1940, having had diabetes for 15 years or more.

Dolger[42] reported albuminuria in 50 percent of 200 juvenile diabetic patients who had retinopathy. A review of the clinical records of 135 young patients with onset of diabetes under the age of 15 years, who died during the period 1944 to 1950, showed antemortem renal damage of advanced degree in at least 72 cases, or 53 percent (Joslin and Wilson[43]).

In 282 cases of diabetes with onset between 15 and 30 years of age, Root, Sinden, and Zanca[44] found the incidence of glomerulosclerosis to parallel the duration of the diabetes and not the age of the patient. Sixty-two patients, or 25 percent, of a group of 247 recently reviewed cases of long-standing diabetes in young persons showed manifestations of "diabetic nephropathy."[45]

Fanconi's[46] pessimistic report also brings out the true importance of the renal element. None of his diabetic children who lived over 16 years of age were free from "nephropathy"; after 21 years, not a single patient was alive. Thus "diabetic nephropathy" proves to be an important complication in young patients. The significance of the term "diabetic nephropathy" will be discussed later.

3. *Renal disease as a cause of death in diabetes mellitus.* Inspection of Joslin's cardiorenal-vascular group of diabetic patients discloses that only two percent of deaths prior to 1937 were due to renal disease.[43] Recently, various reports (for example, De Jong[5]) have stressed the terminal nature of renal disease in diabetes mellitus so that, at present, nephropathy is of major importance as a cause of morbidity and mortality in this disease.

Whereas deaths from coma and gangrene have declined precipitously with the advent of insulin and antibiotic therapy, intercapillary glomerulosclerosis and associated renal pathology have become a menace of increasing proportions as a cause of death in approximately one half of the patients whose diabetes develops in childhood surviving 15 or more years (White[47] and others).

4. *Pathology of intercapillary glomerulosclerosis.* Interest in renal lesions as a complication of diabetes was aroused in 1936 with Kimmelstiel and Wilson's[26] description of a uniform, distinctive pathologic lesion in the glomeruli of eight middle-aged or elderly diabetic patients. The authors correlated the histologic changes in the glomeruli with the presence clinically of hypertension, profuse albuminuria, and generalized edema and termed the condition "intercapillary glomerulosclerosis." There is no doubt that indistinguishable lesions may occur occasionally in nondiabetic patients. However, as Allen[27] points out, this lesion is easily distinguishable from the nephrosclerosis of nondiabetic persons and from the hyalinization of glomerulonephritis.

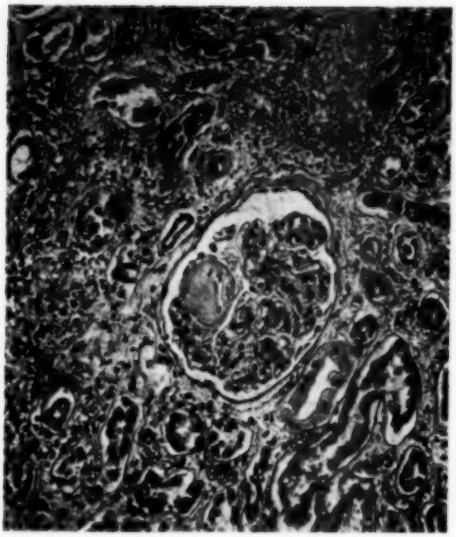

Fig. 2 (Goodman). Section of kidney from a diabetic patient, showing a characteristic nodule of intercapillary glomerulosclerosis (Kimmelstiel-Wilson's disease). (Courtesy of Dr. B. S. Kline and Dr. H. Gold, Mount Sinai Hospital, Cleveland.)

The original glomerular lesion of Kimmelstiel and Wilson is a faintly acidophilic, hyalinized deposit in the central portion of the glomerular lobule (fig. 2).

The lesion may appear either as a spherical nodule in the glomeruli or as a diffuse thickening of the intercapillary septa. A similar hyalin substance is deposited also in Bowman's capsule and a considerable degree of fatty change, including the deposition of doubly refractible bodies, is present in the cells of the tubules, but this, too, is extracellular in position.

These lesions have been described many times since the original report.[34, 48-49] Less severe degrees of hyalinization have been described by Henderson and others,[32] and even lesser degrees of glomerular involvement, that is, only focal fibrosis without hyalinization, by Laipply[34] and others.

Kimmelstiel and Wilson, failing to find any inflammatory changes (active or healed) such as occur in glomerulonephritis, regarded the glomerular lesions as degenerative in nature. Besides, there is no evidence of either capillary proliferation or changes in the basement membranes, such as Fahr described in "intercapillary glomerulonephritis" or McGregor in extracapillary glomerulonephritis. However, in all sections of the Kimmelstiel-Wilson kidney there are found considerable arteriolar changes which differ from the ordinary nephrosclerosis in that the media of the affected arterioles contains a hyalin substance with the same staining qualities as the intercapillary parts of the glomerulus, and showing, in addition, doubly refractile vacuoles which stain like the lipids in the intercapillary masses.

Simon[38] was able to demonstrate the deposition of an intercapillary material in occasional glomeruli which appeared to be continuous with the lipohyalin in the media of the afferent arterioles. In opposition to Kimmelstiel and most other authors, Allen[27] interprets this lesion as an *intramural*, that is, arising within the capillary walls, rather than an intercapillary glomerulosclerosis.

The fact that the lipohyalin in the glomerulus is extracellular in location, and is also found in the arterioles of the kidneys, suggests that it may be a deposit much like amyloid. Though it resembles amyloid in this respect it fails to stain characteristically with any of the special stains for amyloid. In glomeruli which are only moderately involved many loops remain patent, but with increasing hyalinization the loops become closed and the lining cells of the capillaries enmeshed in the extracellular deposit. The chemical composition of this particular type of lipohyalin remains undetermined for the present.

Eversole and his colleagues at the Johns Hopkins Hospital[50] report that the early glomerular lesions of diabetic kidneys are aneurysmal dilations similar to the capillary aneurysms in the retina. Allen had previously called attention to markedly dilated glomerular capillaries packed with red cells associated with the characteristic hyalin nodules of the Kimmelstiel-Wilson kidney.

Some of the less severe changes already mentioned are believed by some[32] to represent an intermediate stage in the development of the more advanced nodular lesions but the relation of these milder lesions to diabetes has not been established definitely. Be that as it may, it is certain that renal function is not affected until the glomeruli are destroyed *in toto* by the large nodules.

5. *Clinical manifestations of intercapillary glomerulosclerosis.* In the eight patients studied by Kimmelstiel and Wilson the glomerular lesions were associated with a characteristic clinical picture. With one exception the records showed that all their patients had diabetes of long standing. Hypertension had been present early in the course of the disease and generalized edema was a striking occurrence in these patients. Because of the amount and distribution of the edema and the constant association of massive albuminuria Kimmelstiel and Wilson classified the condition as nephrosis.

A positive correlation between the severity of the renal lesions and the degree of albuminuria has been emphasized, notably by Henderson,[32] but also by others.[28, 31, 48, 51-53] Henderson and others found that the diagnosis of glomerulosclerosis could be made with a fair degree of accuracy in a patient with diabetes of long duration with albuminuria, hypertension, renal insufficiency, and retinopathy. In this connection it should be pointed out that intercapillary glomerulosclerosis need not necessarily be associated with the nephrotic syndrome.[28]

The laboratory findings in patients with Kimmelstiel-Wilson's disease are in keeping with those usually found in the nephrotic syndrome; namely, a reduction in total blood proteins, marked hypoalbuminemia, a lowering but not a complete reversal of the albumin-globulin ratio and massive albuminuria. Acidosis is said to be uncommon in patients with Kimmelstiel-Wilson's disease; it is actually seen much more frequently in diabetic patients with other types of renal damage and in those without any evidence of renal disease whatsoever.[50]

According to Root and his co-workers[54] hypertension, retinopathy, edema, albuminuria and, finally, uremia are most likely to be seen in poorly controlled patients in whom diabetic coma or severe acidosis has occurred one or more times during the earlier years of the diabetes. They point out that the characteristic renal abnormalities of such patients are not glomerulosclerosis (Kimmelstiel-Wilson's disease) alone, but arteriolosclerosis, particularly of the afferent arterioles, pyelonephritis, generalized arteriolosclerosis, and usually some degree of glomerulonephritis are also present. Apparently, this conglomerate disease picture accounts for the impaired renal function of advanced and fatal cases of diabetes.

6. *Experimentally produced intercapillary glomerulosclerosis.* Recently, Lukens[55] described lesions similar to those of intercapillary glomerulosclerosis in the kidney of a diabetic dog kept alive for five years after injections of crude extract of beef anterior pituitary. The unexpected occurrence of this renal lesion provides the first example known to us of its production in an animal. Very recently, diabetic retinopathy was produced in alloxanized rabbits by the administration of ACTH.[50] The avenue to further investigation of these vascular lesions in the lower animal has thus been opened.

7. *Diabetic nephropathy.* As mentioned above intercapillary glomerulosclerosis is but one of several renal lesions that are seen consistently in diabetic patients at post-mortem examination.[45] Although it may occur at all ages the mixed type of renal disease, which Root and others have termed "diabetic nephropathy," is seen most frequently among patients in their thirties and forties with severe, poorly controlled diabetes of long duration.

The histopathologic findings include acute and chronic pyelonephritis, arteriosclerosis, and arteriolosclerosis as well as intercapillary glomerulosclerosis. In fact, uncomplicated intercapillary glomerulosclerosis was not ob-

served in any of their young diabetic patients.

One cannot consider the Kimmelstiel-Wilson lesion as synonymous with diabetic nephropathy in the sense in which Root uses the term. The renal lesions other than glomerulosclerosis may also occur in nondiabetic patients and are therefore not specific for diabetes. Still, it should be pointed out that extensive arterial and arteriolar sclerosis are observed but rarely in renal disease in nondiabetic patients under the age of 40, with the exception of malignant hypertension.

C. The pathogenesis of retinopathy and intercapillary glomerulosclerosis

Most authors stress the duration of diabetes as a factor in the development of the retinal and renal lesions. Although the effect of the disease is more noticeable in younger diabetics, duration plays a part in all age groups.

None of Dolger's[42] 200 patients below 50 years of age escaped retinal lesions within a 25-year period regardless of the age of onset, severity of diabetes, or the type of treatment used. Every patient who had diabetes before 20 years of age, even those who had maintained excellent diabetic control, had retinopathy after 22 years' survival.

From these data one might infer that every diabetic is destined to develop retinopathy sooner or later.

Bell[28] and others have shown that the development of intercapillary glomerulosclerosis definitely parallels the duration of the diabetes. Dolger noted that 50 percent of the patients with retinopathy had albuminuria.[12]

In essence, these latter findings support those of Root, Sinden, and Zanca[44] which indicate that "nephritis" is a leading cause of death in young persons after 20 years of diabetes.

There is good evidence that diabetes *per se* produces a marked accelerating effect upon the deposition of hyalin material in arteries, especially the renal arterioles. It has been suggested that the hyalin masses of intercapillary glomerulosclerosis are so closely related to arteriolosclerosis that, perhaps, they should be regarded as merely an extension of arteriolosclerosis into the glomeruli.

According to Bell,[28] for example, whenever the intercapillary lesion is present, there is always a Grade-3 hyalin thickening of the afferent glomerular arteriole as well. Certainly, both advanced retinopathy and intercapillary glomerulosclerosis occur in many diabetics who have neither hypertension nor atherosclerosis. Consequently, glomerulosclerosis must be regarded, at least in part, as a direct effect of the diabetic state rather than a simple sequela of atherosclerosis or hypertension.

The possibility remains that diabetic retinopathy is due to a failure in protein metabolism as proposed by Lewis, Schneider, and McCullagh.[56]

The exact relationship of diabetes mellitus to retinopathy and intercapillary glomerulosclerosis is obscure, although their close correlation is attested to by the fact that these lesions occur almost exclusively in diabetics. I endorse the view that diabetes injures the capillaries, venules, and possibly the smaller arterioles of the retina and glomerulus in some as yet unexplained manner.

The coexistence of arteriosclerosis in most patients who die with advanced forms of intercapillary glomerulosclerosis has been confusing. However, from the studies of uncomplicated intercapillary glomerulosclerosis observed occasionally in the young patient free of atherosclerosis who dies in his twenties or thirties, one is forced to conclude that, like retinopathy, even though this lesion is frequently accompanied by atherosclerosis, it is dependent pathogenetically on a diabetic mechanism, not on sclerosis. Also, since the Kimmelstiel-Wilson lesion occurs only rarely in patients with hypertension uncomplicated by diabetes clearly it is not dependent upon hypertension for its development.

The possibility presents itself that the typical retinal and glomerulosclerotic lesions in diabetes mellitus are related somehow to

disturbances in adrenal corticosteroid balance and their effect on the supporting fibrous tissue of the smaller vessels. This concept, which involves some aspects of the stress mechanism, will be elaborated more fully elsewhere.

It is noteworthy in this respect that Rich and others[50] recently reported the production of Kimmelstiel-Wilson's lesions and retinopathy by the administration of cortisone and ACTH to alloxanized diabetic rabbits.

If this hypothesis should be borne out, there may be some hope to counteract incipient retinal and renal damage by better treatment of the patients' diabetes thereby avoiding stress. Research should be concentrated along these lines. Eventually prophylaxis and newer therapeutic aids may prove to be helpful in checking the progress of these complications. Meanwhile, one should keep ever alert for the early signs and symptoms of retinopathy and renal damage.

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PROGRESSIVE SENILE FIBRILLAR ATROPHY OF THE IRIS STROMA

(IRIDOSCHISIS)

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It seems improbable that a more remarkable picture of partial disorganization of a tissue will be encountered than the atrophy and fibrillation of the stromal layer of the iris (pars uvealis iridis) seen in this symptom complex.

Some idea may be gained of the infrequency with which this senile iridic degeneration occurs when it is realized that this report has been preceded by only 12 others.* Schmitt's first recorded case,[1] in 1922, was followed in the next 10 years by six others[2-7] with none to follow until recently when a number of new cases[8-12] have appeared in the literature.†

Such sporadic case reporting cannot be construed as a true index of the incidence of this disease. More frequent recordings of unusual eye conditions are essential in order that there may be a clearer knowledge of their characteristics, prevention, and treatment.

CASE REPORT

Mrs. McA., aged 76 years, was first seen in March, 1952, at which time she complained of occasional pain in each eye for the past three or four months. There had been no inflammation or other eye symptoms. Her past eye history was negative except that both eyes were "blackened" for several months when she was thrown from a buggy 50 years ago. Her general health was and had always been good.

Visual acuity with corrections was: R.E., 20/20; L.E., 20/25. The conjunctiva and cornea of each eye were free of inflammatory reaction. A whitish elevation on the iris was noted just below the border of each small round pupil. In the right eye this extended into the pupillary space and with oblique illumination resembled a corneal scar with anterior synechias. The pupils were centrally placed and gave normal responses.

Transillumination of the right eye showed an indistinct moth-eaten red reflex which was transmitted through the ciliary zone of the iris between the 4- and 8-o'clock meridians and in a small area in the pupillary zone at the 10-o'clock position; in the left eye, there was a similar red reflex in the ciliary zone at the 6-o'clock position and a limited moth-eaten appearance throughout the circumference of the pupillary zone.

The slitlamp showed:

RIGHT EYE. A large triangular sparsely pigmented edematous sheet of iris stroma was reflected up and overlapping the pupillary border (fig. 1-a).

The torn edges of the flap were frayed and supported many coiled fibers and fibrils the ends of which floated free in the aqueous. Thus exposed, the dark rusty-brown ectodermal layers of the iris were seen through a loose meshwork of white branching strands. The latter appeared to be swollen and enveloped in a translucent sheath.

One or two strands were red and suggested the presence of red blood cells. These partially denuded deeper layers of the iris gave no evidence of hole formation. The iris stroma adjoining the dehiscence was atrophic but elsewhere it presented a normal senile topography.

LEFT EYE. The iris was similarly involved in the lower quadrant. The pale fiber bundles

* Five other cases were cited in reports by Vogt,[13] Schoenburg,[6] and Linn;[11] however no details were given with which to establish their authenticity.

† Two additional cases have been reported since this article was accepted for publication:

Blegvad, O.: Iridoschisis. Acta Ophth., **29**:377-381, 1951.

Haik, G. M., Lyda, W., and Waugh, R. L.: Iridoschisis. Arch. Ophth., **48**:40-43, 1952.

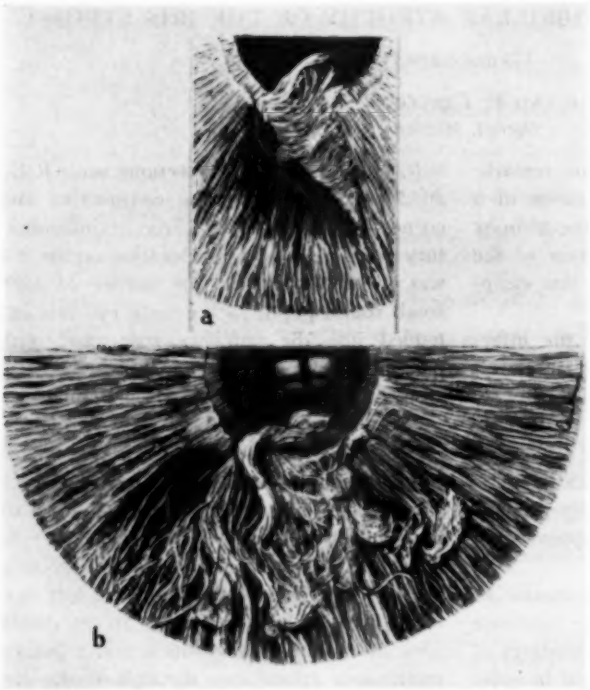

Fig. 1 (Carter). (a) Slitlamp drawing of the right eye. (b) Slitlamp drawing of the right eye six weeks later.

were more mascerated and bunched in coiled fibrils which waved freely with the slightest movement of the eye. Rusty pigment dots flecked the fragmented bundles but none were observed on either the corneal or lens surfaces.

The iris stroma elsewhere was atrophic and radial sulci divided the face of the iris into pie-shaped sectors. With a narrow light beam, considerable elevation of the stromal layers was demonstrable as they arched sharply forward from the foreshortened chamber angle to the pupillary border.

Gonioscopy. The anterior chamber angle was so acute that examination of its extreme periphery was impossible. To the limited extent permitted, no debris or adhesions were observed.

Visual fields. Peripheral, right eye, normal; left eye, 15 degrees concentric contraction. Central, moderate enlargement of the physiologic blindspot in each eye.

Intraocular pressure. Right eye, 20 mm. Hg. (Schiøtz); left eye, 28 mm. Hg. Provocative tests with a mild mydriatic: R.E., 32 mm. Hg (Schiøtz); L.E., 69 mm. One hour after instillation of pilocarpine nitrate (four percent), the tension in each eye had returned to normal and has remained so under daily instillations of pilocarpine nitrate (two percent).

Comment

The pathologic changes observed here were typical of those described in preceding reports. The sequence of events seemingly follows a pattern of stromal iris atrophy, imbibition of aqueous, separation from the posterior layers and rupture of the distended fiber bundles. The latter finally become macerated and further broken down into twisted fibrils.

Senility, with perhaps a congenital weak-

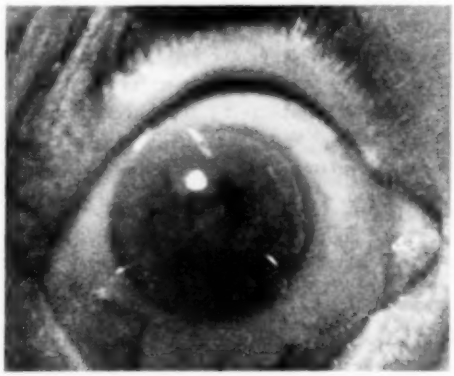

Fig. 2 (Carter). Right eye, showing pupillary space almost completely filled with undulating loose ends of iris tissue.

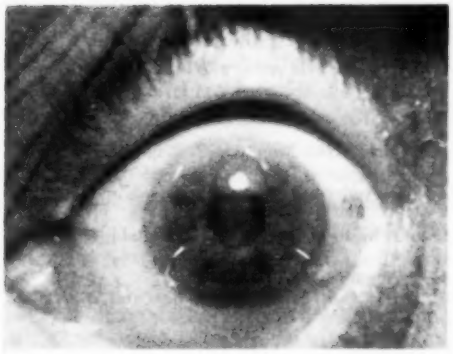

Fig. 3 (Carter). Left eye, showing more extensive atrophy throughout the circumference of the iris.

ness or predisposition, is a primary etiologic factor which is born out by the average age (61 years) of the reported cases.

Vogt[13] likens the point of election of ruptures in the lower one half of the iris to the subluxated lens and retinal separation seen in the aged and attributes their location to the pull of the force of gravity. This together with the action of the convection currents of the aqueous, as suggested by Garden and Wear,[10] would seem to merit consideration as a likely hypothesis.

A more interesting theory, however, is that of Loewenstein and Foster[8]: " . . . basic change is senile but the process may be aggravated by proteolytic enzymes (lysins) in the aqueous. . . ."

In support of the latter is the iridic disorganization seen in two cases following injury. Also in this respect, the present case may be cited, in which during a few weeks there was a rapid break down of the thick iris sheet (fig. 1-a) into a twisting filamentous mass (fig. 1-b).

Glaucoma operations preceded the onset of iris changes in four and were present at the time the disease was discovered in two of the previously reported cases. In all others, no mention was made of an elevation of the tension. Glaucoma does not appear to be an important complication of the disease.

In the few patients on whom gonioscopic examinations were made there was little or no evidence of anterior-chamber angle blocking by anterior synechias or debris. In the present case an acute rise in tension was seen to follow mydriasis in an anterior chamber whose filtration angle was already dangerously narrowed.

Conclusion

Similarities between this localized stromal atrophy of the iris and progressive essential atrophy of the iris have undoubtedly been noted by previous observers. The dissimilarities, however, are in the preponderance and it can be concluded there is little or no relationship between these disease entities (table 1).

Atrophy, separation, fragmentation, and fibrillation are localized to the stromal layer of the iris. The disease is progressive in nature (Vogt, Dollfus) and may be accentuated by (operative) trauma. The etiology remains obscure, advanced age acting as a prominent contributory factor.

It is suggested that this disease may appropriately be called progressive senile fibril-

TABLE 1

Progressive essential atrophy of the iris vs. progressive senile fibrillar atrophy of the iris

	Age	Iris Involvement	Pupil	Glaucoma	Chamber Angle
Progressive senile fibrillar atrophy of the iris stroma	Preponderately in 7th decade	Usually bilateral, stromal layer without hole formation	Normal, centering and reaction	Present in about 50 percent of the cases	Narrow
Progressive essential atrophy of the iris	Preponderately in the 3rd decade	Unilateral, full thickness with hole formation	Displaced, inactive, ectropion uveae	Almost invariably develops	Blocked by iris debris, anterior synechias

lar atrophy of the iris stroma. Iridoschisis (iris splitting), a term suggested by Loewenstein and Foster for this disease, has the merit of brevity but otherwise fails adequately to suggest the nature of the disease.

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HEMANGIOMA OF THE ORBIT*

A REPORT OF TWO CASES

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Vascular tumors of the orbit never cease to be interesting, though they occur infrequently even in large clinics. They often tax the ingenuity of the most experienced ophthalmologist and, even with all the diagnostic resources of the present day, the diagnosis may still be in doubt. The reason for this is that these tumors frequently occur behind the globe, an area inaccessible to inspection, palpation, and expert laboratory studies. A carefully taken history may provide the only clue to the diagnosis.

Vascular tumors may occur in any part of the body. Five percent of all patients admitted to the Memorial hospital in New York during an eight-year period had vascular tumors; of the 75 percent which were present at birth, 85 percent were detected before the first year. Although the head and neck comprise only one seventh of the body surface, 56 per cent of all vascular tumors occurred in this area. These lesions seemed to be more common in females than in males.[1]

According to Ewing, an angioma is a true neoplastic process involving vascular or lymph tissue. Such tumors are thought to be congenital in nature and Ewing says that practically all are present at birth.[2]

CLASSIFICATION

The best known classification of angiomatous tumors is that of Reese[3] who divides

* Presented before the Chicago Ophthalmological Society, March, 1952.

them into four groups: (1) Capillary, (2) cavernous, (3) angioblastic, and (4) racemose or cirsoid. The classification is not a rigid one since characteristics of all four types may be seen in one lesion.

Capillary hemangiomas consist of a new growth of blood vessels with well-differentiated endothelium and delicate connective-tissue stroma. Capillary vessels are lined with a single layer of endothelium and the lumen contains only a few blood cells. Clinically, this type of tumor appears as a well-circumscribed, finely lobulated, slightly elevated tumor, usually bright red in color. It may vary from a few millimeters to a few centimeters in diameter. These lesions blanch poorly on pressure. They usually grow slowly.

Cavernous hemangiomas are composed of thin-walled, widely dilated blood sinuses, engorged with blood, purplish blue in color, and easily compressible. They blanch readily under pressure. These tumors may extend deeply into the subcutaneous tissue and into the orbit. In the orbit, they are usually found in the anterior third.

Mixed cavernous and capillary types are quite common. The capillary portion may surround the cavernous lesion. These tumors grow rapidly and may attain great size.

They may lie dormant for years, and then suddenly become noticeable when thrombosis occurs. When thrombosis does occur, they may become very large overnight.

There may be edema and discoloration of the skin over the lesion and, if in the orbit, exophthalmos or lateral displacement of the globe may occur within a few hours, depending on the site of the tumor. Chemosis is usually mild, but may be marked.

Large orbital hemorrhages may occur, which may frighten the patient and cause the ophthalmologist much concern especially if there is marked exophthalmos. The hemorrhage may then absorb and the exophthalmos and tumor may entirely disappear until the next attack of thrombosis.

According to Reese, there is a monomorphous group of tumors which may occur in the orbit, on the lids, or on the skin. It is disputed whether these tumors are true neoplasms or are congenital rests. Reese feels that these lesions belong to the polymorphous group of congenital rests.

The hemangio-endothelioma is a potentially malignant vascular tumor which has as its stem cell the endothelial cell. The microscope reveals a formation of small anastomosing vascular channels outlined by a delicate framework of reticulum fibers. The growth of the typical embryonic endothelial cells produces greater numbers than are required to line the channels.

The lesions which occur early in life are congenital and may show a benign course. These tumors have endothelial cells arranged in a more orderly manner than those of the malignant variety. They may occur anywhere on the face, eyelids, or in the orbit.

The diagnosis of orbital vascular lesions may be difficult or easy, depending upon the state of development when the ophthalmologist sees the tumor or upon where the tumor is situated. Lesions deep in the orbit are always a problem because this area is inaccessible to inspection.

The most common sign is exophthalmos.[4, 6] If it is sudden, one is almost sure that a vascular lesion is present. If it is slow and insidious, a neoplasm is more likely. Lateral or forward displacement of the globe is more likely if the tumor is in the anterior third of the orbit because the globe fills most of the space in this area.

The proptosis may vary greatly depending on the variation in size of the tumor. If vascular stasis of venous circulation occurs, the proptosis may be dramatically and suddenly marked. Any maneuver that increases congestion in the jugular area, such as venous compression, crying, coughing, lowering of the head, and so forth, may increase the size of the lesion.

Vision and ocular motility are seldom affected in tumors of the anterior third of the orbit. It is only when the tumors are far back

in the cone, involving the optic canal or nerves, that the vision or ocular motility is affected. Occasionally edema of the optic disc or marked engorgement of the venous system of the retina is seen.

Diagnosis

The stethoscope is seldom of any help even in true arterio-venous aneurysms because the vessels are so small that bruit is seldom heard. Vocal resonance may be tried but is seldom of value. X-ray examinations are seldom positive and, when they are, they usually indicate a serious condition.

Tumors with arterial pulsation are prone to cause bony erosions and invade surrounding structures. Soft tissue X-ray studies may be of value since tumors may be detected by difference in density of orbital structures. Some authors[5] speak of increased density of the sphenoid ridge, but the picture of hyperostosis does not always mean extraorbital extension. This sign should, however, be considered a serious one.

When the mass is in the anterior third of the orbit and fluctuation can be detected, there is no harm in inserting a good-sized needle into the lesion. If blood is easily obtained, one can then justifiably inject a radiopaque medium such as neo-iopax into the cavity. The tumor can be beautifully outlined by this means and its extent easily determined. The character of the venous exit can also be determined by the speed with which the opaque medium leaves the cavity. Occasionally arteriograms are helpful in determining the character of the lesion.

The prognosis of hemangiomas is usually good. They are usually encapsulated and have limited growth and therefore are amenable to treatment.

Treatment

Treatment methods vary widely. Some ophthalmologists favor excision, others favor injections with sclerosing solutions, while still others favor some form of radiation, such as X rays or radium. The method of choice depends on the type and site of the tumor.

In our clinic we favor surgery if the tumor is in the anterior one third of the orbit and is readily accessible. Careful removal may be accomplished with very little damage to the surrounding tissue and the cosmetic result is usually excellent. Occasionally, considerable trouble with hemorrhage may be encountered but this usually can be controlled.

In the posterior two thirds of the orbit we also favor excision either by the Krönlein approach or, in the hands of a neurosurgeon, the intracranial approach. The second method gives excellent exposure and intracranial extension can be easily detected. To be sure, opening the skull is a hazardous procedure but the excellent results obtained nearly always justify such a method.

If one is unable to remove the tumor completely by surgery, one can still insert radium needles into the remaining lesion or give roentgen therapy. These tumors respond well to roentgen rays and radium; however, if roentgen or radium therapy is given in quantities sufficient to destroy these lesions, permanent injury to the eyeball and surrounding tissues is often produced. For this reason we favor surgery whenever possible.

Tumors may respond satisfactorily to the injection of alcohol, sodium morrhuate, or other sclerosing solutions, but the results never equal those obtained when the tumor is expertly excised. Surgical removal, therefore, is the method of choice whenever possible.

Case reports

Case 1

History. Mr. K. F., aged 23 years, a railroad fireman, first came to the Christie Clinic on April 13, 1951, stating that on February 12, 1951, when he awakened, he noted a dark blue area under the left eye. During the day the area began to swell, but not sufficiently to close his eye. This swelling had been more or less intermittent since the onset of symptoms.

He gave no history of injury and had never noted anything before the first symptoms. He did not suffer from diplopia or loss of vision. He had no vascular lesions or tumors on any other part of the body.

He noted that if he lifted a heavy object or did anything to increase vascular stasis his eyelid became more blue and the lower eyelid became swollen. A recent physical examination was entirely negative. There was no familial history of disease.

Vision was: R.E., 20/20, and examination of the globe and orbit was entirely negative. L.E., 20/20; he could read 14/14.

The lids of the left eye opened and closed normally, and the lid margins were normal. The lower lid was slightly elevated and there was a blue, slightly elevated mass under the skin (fig. 1). It measured 2.0 by 1.0 cm. in size, fluctuated on palpation, and seemed to extend forward from the lower temporal quadrant of the orbit at the 4-o'clock position. The conjunctiva was not edematous but the bluish mass could be seen through the conjunctiva. At about the 6-o'clock position, there seemed to be another and separate blue mass which also fluctuated.

The masses did not pulsate and a bruit could not be heard. Venous stasis tests did not markedly increase the size of the lesion, if at all. The Hertel exophthalmometer readings were: R.E., 12 mm.; L.E., 14 mm. at 110 base. The ocular motility was normal and the globe did not seem to be displaced.

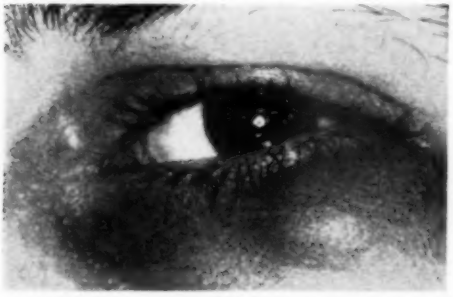

Fig. 1 (Albers and Tokar). Case 1. Appearance before surgery showing the two lobulated sacculations at the lower orbital rim.

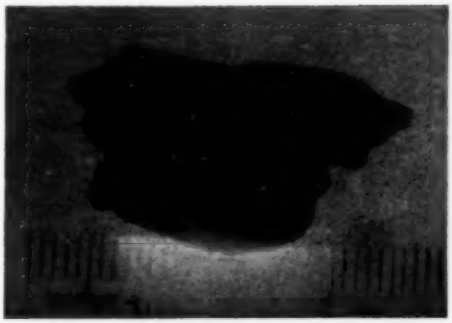

Fig. 2 (Albers and Tokar). Case 1. The gross appearance of the cavernous-capillary hemangioma, which was removed.

Examination. The next day an 18-gauge needle was easily inserted into the mass and 3.0 cc. of dark red blood were obtained. An equal amount of neo-iopax was then injected and X-ray pictures taken.

The pictures revealed a multiloculated sacculation which extended posteriorly and laterally. The largest sacculation measured about 1.5 cm. in size, and showed communications with small-sized sacs, the smallest of which measured about 2.0 mm. No arterial or venous channels were demonstrated.

Reëxamination in one hour revealed that none of the media remained. A diagnosis of cavernous hemangioma was made.

An incision was made in the wrinkle line on the lower eyelid at the lower orbital rim. The orbital septum was incised, exposing a bluish lobulated tumor extending well back into the orbit at the 4-o'clock position, between the muscle cone and the periosteum. It seemed to arise from a small nutrient vessel coming from the periosteum about 2.0 cm. behind the orbital rim. The tumor was encapsulated and removed in total without much difficulty or bleeding.

Pathology. The specimen consisted of a cystic structure measuring 3.0 by 1.8 centimeters in greatest dimensions (fig. 2). The wall measured 2.0 mm. in thickness. Projecting from the inner lining was a mass of soft, friable, dark reddish-gray tissue which meas-

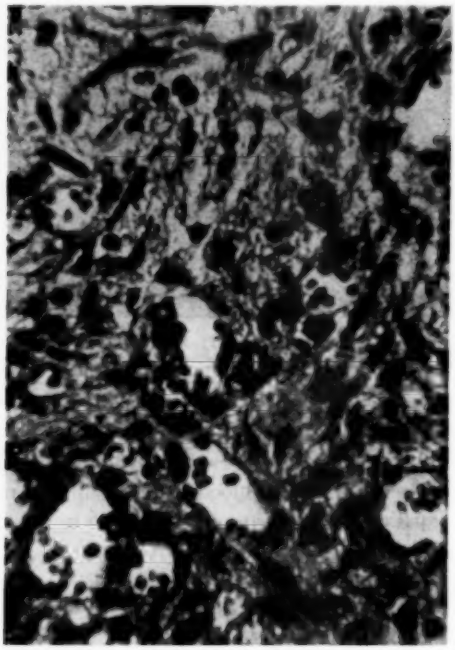

Fig. 3 (Albers and Tokar). Case 1. The microscopic appearance of the lesion.

ured 1.5 cm. in diameter.

Sections showed many closely packed, thin-walled capillaries lying in a scant connective tissue stroma (fig. 3). These capillaries were lined by a single layer of flattened endothelial cells and were engorged with red blood cells. In some areas, there was considerable fibrous connective tissue proliferation. Areas of hemorrhage were found throughout the section.

Diagnosis. Cavernous-capillary hemangioma.

The patient remained in the hospital two days. Convalescence was uneventful and there has been no evidence of recurrence. The cosmetic result was excellent (fig. 4). Ocular motility is normal.

Case 2

History. J. E. K., aged three and one-half months, was first seen at the Christie Clinic on May 31, 1951. The mother had noted a mass about the size of a pecan at the inner end of the right brow at the orbital rim since birth. The mother noted that the mass was slowly increasing in size and wanted it removed. The child was otherwise healthy. She had one sister, aged six years, who suffered from Mongolism. The familial history for congenital defects was otherwise negative.

The child was examined in the Departments of Ophthalmology and Dermatology, and a diagnosis of hemangioma of the orbit was agreed upon. We advised the mother to bring the child to the clinic each month for observation.

In the next three months the tumor enlarged slightly, and the child developed some dilated veins on the skin of the upper lid. This frightened the family, so they demanded surgery at once.

Examination. The right globe was normal in size, shape, and position, and was free from disease. At the upper inner angle of the right orbit at about the 2-o'clock position, there was a mass 2.5 by 1.0 cm. in size. It seemed to arise from the orbit at about that point. It was freely movable and, when the child cried, it got blue and considerably larger. There were some dilated veins running from the mass over the skin of the upper lid. X-ray studies of the orbit were negative for defect or disease.

Treatment. Under general anesthesia an incision about 4.0 cm. in length was made through the patient's brow. The hemangiomatous mass was dissected free from the

Fig. 4 (Albers and Tokar). Case 1. The postoperative appearance of the operative site.

surrounding tissue and was found to be more or less encapsulated, but attached just within the orbit at the 2:30-o'clock position. The nutrient vessels in that area were tied and severed as far down as we could reach safely. All bleeding was easily controlled and the incision was closed by 4-0 interrupted silk sutures.

Pathology. The specimen consisted of a piece of reddish-gray tissue which measured 3.5 by 1.6 cm. in its greatest dimensions. The sectioned surface was reddish-gray and smooth.

The pathologic diagnosis was hemangio-endothelioma.

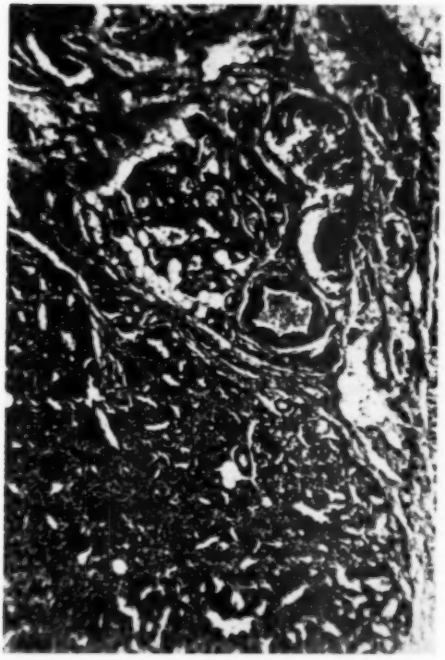

Fig. 5 (Albers and Tokar). Case 2. The microscopic picture of the hemangio-endothelioma.

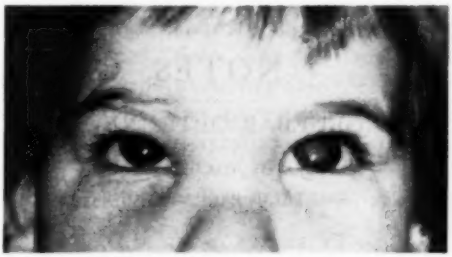

Fig. 6 (Albers and Tokar). Case 2. Appearance of the patient six months after surgery. Note that there is no evidence of recurrence.

The microscope clearly demonstrated the gross microscopic features of this lesion (fig. 5).

On the left side of the picture one can see the masses of endothelial cells with early capillary formation. Particular attention may be paid to the open-endedness of the capillaries which indicates, of course, active proliferation in growth.

The right side of the section shows two large angiomatous sinuses in the lower portion, above which is a small cluster of smaller angiomatous sinuses. Immediately to the left of these two structures is seen a normal vein. That part of the slide seen on the right demonstrates what may be considered the structure of a pure hemangioma without features of hemangio-endothelioma. One can see clearly the sharply defined margins of the tumor, showing the lack of invasiveness.

Diagnosis. Hemangio-endothelioma.

Convalescence was uneventful and to date there has been no evidence of recurrence (fig. 6). The dilated veins in the upper lid have disappeared.

Christie Clinic.

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NOTES, CASES, INSTRUMENTS

RETROBULBAR OPTIC NEURITIS

CAUSED BY TOXICITY FROM DIGITALIS PREPARATIONS

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Schenectady, New York

Hermann,[1] in 1944, was the first to observe an increase in digitalis poisoning. He ascribed this condition to the drug's more universal use and the larger therapeutic dosage prescribed for early digitalization. Of all the glycosides, digitoxin, the most popular, has the slowest rate of dissipated action, its toxicity being more severe and persisting longer than that of any other digitalis preparation.

Recently, Master[2] stated that the dangerous features attending the administration of digitoxin have been disregarded, Gold's[3] average dose being indiscriminately prescribed for all patients with the result that the frequency of digitoxin intoxication has been increased. Master[2] further stated that digitoxin poisoning has now become so frequent an occurrence that it presents a real hazard.

Levine[4] felt that the lack of warning signs of the usual toxic side-effects demands that physicians be more alert to the possible insidious development of other evidences of toxicity.

In spite of this increased frequency of digitoxin intoxication, case reports of visual disturbances resulting from the use of digitalis preparations are comparatively meager. Gillette[5] finds this difficult to comprehend and believes that ophthalmologists do not see such cases or that the physicians in attendance are not concerned with visual disturbances. Gillette[5] and Wagener[6] have published detailed historic reviews of digitalis poisoning affecting the eye.

In the literature, the visual symptoms of digitalis intoxication have been recorded as follows:

Chromatopsia, diplopia, partial hemianopia, early soft wavelike light flickerings, light flashes, snow or hoar-frost appearance of bright objects, indistinct, dim, disturbed or confused vision, headaches, amblyopia, nystagmus, mydriasis, and conjunctivitis. Of these symptoms, diplopia, nystagmus, and mydriasis were reported as infrequent, the soft light flickerings and flashes of light as early symptoms, and chromatopsia indicated profound intoxication.

Gillette[5] described three cases; the first and third had a small central scotoma for colors; the second, a small central scotoma evidenced on reduced illumination.

Wagener[6] reported the first definite instance of retrobulbar neuritis caused by digitalis poisoning. I[7] reported a second definite case of retrobulbar optic neuritis, which was, however, due to digitoxin intoxication.

That digitalis retrobulbar optic neuritis may be irreversible with persistence of the central scotoma despite treatment and the withdrawal of digitalis was brought out by Vail.[8] Editorially, Vail noted his observation for over a year of a case of acute toxic retrobulbar optic neuritis due to an excessive dose of digitalis.

Of the three cases presented herein, Case 1, using digitoxin, showed an irreversible central scotoma; Case 2, due to digifoline, exhibited a centrocecal scotoma which was reversible; and Case 3, due to tincture of digitalis, had a reversible central scotoma.

REPORT OF CASES

CASE 1

C. H., a 71-year-old white woman, in poor physical condition, was first seen on June 30, 1947, complaining of blurred vision in both eyes. She had used digitalis preparations intermittently for the past 25 years, and more

or less continuously since 1943. In 1946 she noted blurred vision. For one year prior to her visit, she had taken digitalis nativale, 0.1 mg. daily.

Ocular examination showed vision to be 3/400, O.U. Externally, the eyes were normal except for an arcus senilis. Slitlamp examination revealed a few cuneiform opacities. The fundi were normal except for moderate arteriovenous compression and widening of the light reflex. Refraction showed a compound hyperopic astigmatism; vision, O.U., was correctible to 20/400. Tension was 26 mm. Hg (Schiøtz), O.U.

Visual fields with full illumination showed a central scotoma in both eyes. X-ray studies of the skull failed to show any evidence of calcareous degeneration of the arteries at the floor of the cranial cavity.

Course. Tonometry at all times was normal. The central scotomas never disappeared. For a period of one year after digitoxin was discontinued, vision improved to 20/70 and the central scotomas measured about three degrees. When last seen on January 11, 1949, corrected vision was 20/25−2, but the central scotomas remained the same.

Case 2

J. W., a 53-year-old white woman, was first seen on September 6, 1947, for refraction. Corrected vision was 20/20, both eyes. External examination, slitlamp, fundus, and fields were negative.

She was next seen on January 17, 1948, with the history that, three weeks previously, rapid digitalization was administered with digifoline (0.5 gr., six capsules per day for the first three days and then one capsule daily). From the onset of medication, nausea and vomiting occurred; at this date nausea persisted.

Examination showed corrected vision to be: R.E., 20/60−1; L.E., 20/80. Externally biomicroscopic and fundus findings were normal. Central fields, with full illumination and a one-mm. white test object, showed a three-degree central scotoma in the right eye and a large centrocecal scotoma in the left eye.

Progress. On January 31, 1948, after no digitalis for two days, no change occurred in the scotomas. On March 6, 1949, the scotomas measured one degree in the right eye and two degrees in the left eye. From then on, the central scotomas decreased in size until on January 14, 1948, they were no longer present.

Case 3

A. J. was seen during March, 1949, complaining of inability to read for any great length of time. The past history was unremarkable except that for one year he had been using tincture of digitalis (one drop, three times daily). At no time were there any subjective toxic symptoms.

Corrected vision was 20/30, O.U. Externally, eye findings were negative. Biomicroscopy was normal. The fundi showed slight arteriovenous constriction. Refraction showed compound hyperopic astigmatism. With the new correction, vision was unimproved.

Central fields under reduced illumination showed a one-degree pericentral scotoma in both eyes; with full illumination, the scotomas were not elicited. Three weeks after the tincture was discontinued, the central scotomas were absent.

Conclusions

1. The central scotomas may be pericentral or centracecal, reversible or irreversible.

2. A scotoma may be an early sign of digitalis toxicity.

1330 Union Street.

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BLASTOMYCOSIS OF THE CONJUNCTIVA

Report of two additional cases

E. Theodorides, M.D., and
D. Koutrolikos, M.D.
Ioannina, Greece

In the April, 1950, issue of the American Journal of Ophthalmology we reported two cases of blastomycosis of the conjunctiva, and we now wish to add two additional cases to the literature. Both of these cases occurred in civilians.

Case 3*

History. S. Th., a man, aged 43 years, came to our office complaining of having first noticed, three years ago, a white spot the size of a pinhead on his left eye. The spot had become larger and was now the size shown in Figure 1.

* Presented before the Greek Ophthalmological Society, Athens, April, 1948.

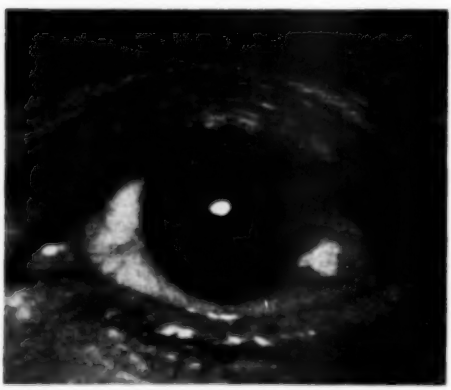

Fig. 1 (Theodorides and Koutrolikos). *Case 3.* Blastomycosis of the conjunctiva.

Fig. 2 (Theodorides and Koutrolikos). *Case 3.* A fresh smear (1:450), showing the plasmoid shape of the fungus with two chlamydospores. Epithelial cell with leishmaniform fungi.

It was summer when the patient first became aware of the spot, and he noticed that, during the winter, it became smaller and then increased in size in the following summer. At the onset of the infection, there were no other symptoms; later, a foreign-body sensation developed together with lacrimation and photophobia.

Eye findings. Since the patient had to leave for his village, there was no time to examine the vision or fundi. There was no night blindness.

In the left eye at the 3-o'clock position was a white spot which had the appearance of freshly made soap suds. The spot reformed immediately after retraction. It did not stain with methylene blue. The use of mercuric yellow (two percent) did not in this case produce rapid reproduction of the fungus. The right eye was healthy.

Fig. 3 (Theodorides and Koutrolikos). *Case 3.* Appearance of the smear 15 minutes later.

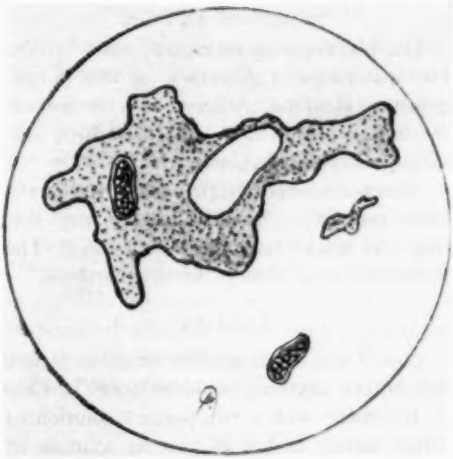

Fig. 5 (Theodorides and Koutrolikos). *Case 4.* Fresh smear (1:450), showing plasmoid shape of the fungus with one chlamydospore.

CASE 4†

History. Miss Stamatia P., aged 25 years, the sister of a soldier from a village of the Distrato-Konitsa area, came to the 406 Military Hospital complaining of the appearance of white spots on both eyes three years ago. Other symptoms were foreign-body sensations and a slight tearing in the sunlight.

Eye findings. Vision was 10/10, O.U. The fundi were clear. There was no night blindness. In the right eye, at the 3- and 9-o'clock positions were small white spots. In the left eye at the 3-o'clock position was one white spot (fig. 4). All of these spots had the same characteristics as those described for Case 3.

LABORATORY STUDIES

All cultures made in Sabouraud's medium in malt agar and sour agar were negative. The animal tests were also negative. Only fresh preparations were of interest. Figures 2, 3, 5, and 6 detail the microscopic findings.

† Presented before the Greek Ophthalmological Society, Athens, June, 1950.

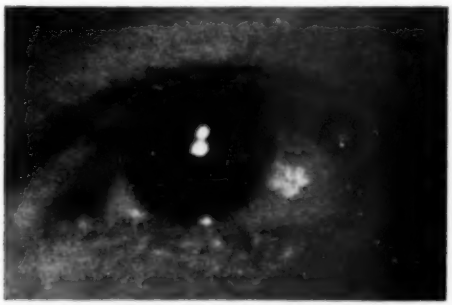

Fig. 4 (Theodorides and Koutrolikos). *Case 4.* Blastomycosis of the conjunctiva.

Fig. 6 (Theodorides and Koutrolikos). *Case 4.* Appearance of the smear after 30 minutes.

Histologic examination

The histologic examination, made in the Histopathologic Laboratory of the Evangelismos Hospital, Athens, of a section of the bulbar conjunctiva (Case 4) which contained a white spot showed:

"Intensive hemorrhagic penetration of the loose connective tissue. The capillary system was dilated and filled with blood. The epithelial tissue showed no degeneration."

Therapy

Case 3 was not treated because the patient left before anything could be done. In Case 4, treatment with a two-percent solution of silver nitrate and a 20-percent solution of zinc sulfate brought no results. We then resorted to cauterization with electrogalvanic current which effected a complete cure.

406 Military Hospital, B.S.T. 900.

A NEW PINHOLE TEST AND EYE-DOMINANCE TESTER*

Conrad Berens, M.D., and Jean Zerbe
New York

Two separate instruments have usually been required for making the pinhole test for visual acuity and the eye-dominance examination. For convenience a new small device† has been constructed which combines these tests and is also useful as a cover in performing the cover test for muscle imbalance. This tester is small, flat, and fan-shaped and made of opaque, black plexiglas, three mm. thick (fig. 1-A).

Description of tester

The fan part measures 40 mm. in length and 45 mm. in width at the top, decreasing to 28 mm. at the bottom where it tapers to a handle. The handle, which measures 70 by 18 mm., is perforated near the lower extremity for convenience in hanging the apparatus. On one side of the fan-shaped part of the sighting eye tester there is a circular depression 20 mm. in diameter.

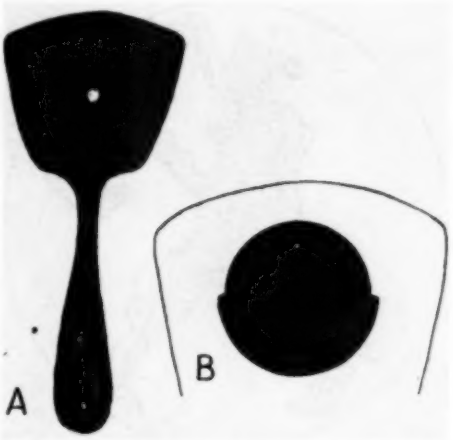

Fig. 1 (Berens and Zerbe). (A) Black plexiglas pinhole test and eye-dominance tester. (B) Half-circle disc rotates to cover six-mm. aperture (which is used to determine eye dominance), exposing 1.5-mm. pinhole which is used to determine maximum visual acuity. The disc may be rotated to cover both openings when using the tester as an occluder.

A pinhole 1.5 mm. in diameter has been bored in this depression four mm. below the tip edge. This pinhole size has been found best for testing visual acuity and is preferred to a one-mm. hole. An aperture six mm. in diameter has been bored one mm. above the bottom edge of the 20 mm. depression. The six mm. opening is sufficiently large for studying eye dominance.

A half circle disc, rotating on a pin in the center of the circular depression, covers the larger opening, or the pinhole (fig. 1-B), or both as desired. When both openings are covered, the device may be used as an occluder.

The pinhole test

The pinhole test is valuable in differentiating lowered visual acuity, caused by a refractive error, from reduced visual acuity, caused by obstruction of light rays, or a pathologic process in the retina or visual

* Aided by a grant from The Ophthalmological Foundation, Inc.

† Made by R. O. Gulden, Philadelphia, Pennsylvania.

pathways. The pinhole eliminates the peripheral rays and permits only the central direct rays to pass through.

Vision which can be improved with a pinhole can usually be improved with lenses. Because light is excluded by the pinhole, however, the test may be misleading, yielding little or no improvement in vision in highly myopic patients and in patients whose light sense is diminished.

Pinhole vision without correction

If a patient's vision is less than 20/20 without correction, determine his pinhole vision without lenses. Rotate the half circle disc so that the six-mm. opening is covered, then request the patient to read the chart through the 1.5-mm. pinhole in the instrument held close to one eye while the other is covered.

Record the best vision thus: V. O.D. with P.H. = 20/20 (or whatever line of test type he reads). Repeat the same procedure for the left eye. Record the vision thus: V. O.S. with P.H. = 20/30 (if 20/30 type is read).

Pinhole vision with correction

Determine the patient's vision for each eye separately not only with his previous distance correction alone but also with the aid of the pinhole in the instrument held before the correction.

Record the visual acuity for each eye thus: V. O.D. with correction and P.H. = 20/20. Any improvement noted when the pinhole is placed in front of the correction usually indicates that visual acuity can be improved by means of proper correcting lenses.

Test for determining the sighting or dominant eye

Determining the master eye may be important in patients who have reading difficulties, for people who shoot, and in recording data in industrial cases when the question of monetary compensation might arise. In patients who have reading difficulty it is also advisable to check eye dominance with hand, ear, and foot dominance.

Rotate the half circle disc so that the pinhole is covered. Direct the patient to hold the instrument at arm's length with both hands and with both eyes open attempt to fixate the light or any small object through the six-mm. opening. While the instrument is still held in place cover the eyes alternately to note which eye has been fixing the light. If one eye is used consistently in this test it is probably the sighting eye. The test should be repeated with the screen held in the right and then in the left hand.

708 Park Avenue (21).

FOREIGN-BODY ABRASIONS OF THE CORNEA*

Acting as a concave lens

Irwin J. Cohen, M.D.
New York

In the past several years, while examining many eyes with foreign bodies of the cornea, an interesting optical phenomenon has been noted. Foreign bodies, scars, and so forth have been shown to cause unusual optical effects during the slitlamp examination of the eye.[1,2] A bowl-shaped faint opacity of the cornea was demonstrated as the cause of an unusual ophthalmoscopic shadow easily observed with a plus 2.00 lens.[3]

Saltzman and Greenwood,[3] in 1950, were the first to report that a shadow was cast by such a lesion on the intraocular structures (posterior surface of the cornea, iris, anterior capsule of the lens, vitreous, and retina) when the eye was viewed with the ophthalmoscope. The effect was one in which the thinning of the cornea in the area of the opacity acted as a minus lens to produce a shadow.

I propose to explain, in a similar manner, the small shadow which can be elicited after the removal of a corneal foreign body.

* From the Department of Ophthalmology, New York University—Bellevue Medical Center.

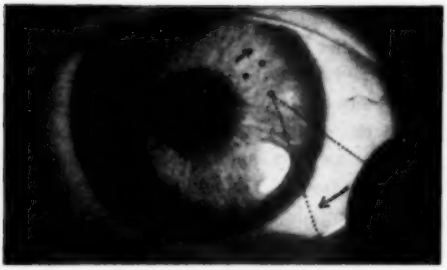

Fig. 1 (Cohen). Flashlight examination reveals the shadow. Note the "against" movement of the shadow when compared to the light.

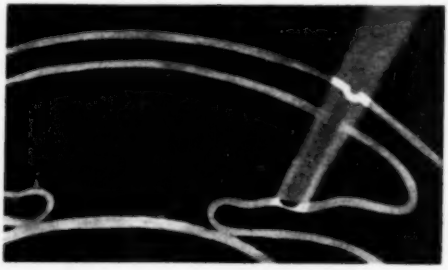

Fig. 2 (Cohen). Schematic cross-section representation of Figure 1. (Modified after Berliner.)

The usual corneal abrasion which remains after the removal of the offending particle is a small sharply concave pit. This corneal depression can be made to throw a shadow by the use of the concentrated beam of the pocket flashlight. The corneal foreign body is removed in the usual manner with the lids held open by the thumb and forefinger of the examiner. It is imperative that the lids be held open after the particle has been removed. If this is not done the precorneal film will fill the defect with fluid and the optical effect to be described will not be seen.

The flashlight beam is directed toward the area of the defect from the lateral or nasal aspect of the involved eye. If the light is moved up and down while the beam is kept focused on the defect, a shadow will be produced. For the sake of convenience, it may be cast on the iris in order to demonstrate its presence more easily. When the light is moved as described, the shadow will be seen in an "against" movement on the iris (fig. 1).

A schematic demonstration of the optical phenomena shows the normal posterior concave surface of the cornea combined with the abnormal sharply concave anterior pit. The particular corneal segment is changed from a normal plus lens to a very high minus lens (fig. 2).

It is evident that, by virtue of the divergent effect of this "minus lens," an image which is less bright will be cast. The more concave the defect, the easier it is to demonstrate. The shadow which is cast appears larger than its actual size due to the magnifying effect of the normal cornea through which it is viewed by the examiner.

In a busy hospital clinic, this technique may be employed to advantage since it is completed in the actual act of removing the foreign body. It may well save the extra step of staining the cornea with fluorescein to demonstrate abrasions of this nature. It goes without saying that should no shadow be elicited, good practice requires that staining be carried out.

We have used this technique to advantage for several years at this hospital and, since the appearance of the report by Saltzman in 1950, have associated his name with the phenomenon.

54 Riverside Drive.

The excellent illustrations are the work of Mrs. Beatrice B. Grover, Bellevue Hospital.

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SEVERE HYPEROPIA

Associated with corneal vascularization and scarring

Ephraim L. Manning, M.D.
Davenport, Iowa

History. Mrs. H. M., a 27-year-old housewife, complained of loss of vision in both eyes during the past few years. On further questioning she stated that, since the age of 14 years, her eyes had teared and been slightly red but that at no time were they ever markedly inflamed. Serologic studies made at three different times were negative.

Examination of the eyes showed mild chronic blepharoconjunctivitis of each eye. There was very much deep vascularization of each cornea reaching in from the limbus all around the periphery; it resembled that seen in old interstitial keratitis. There was scattered scarring of each cornea.

Vision was 20/200, O.U. The fundi were essentially normal.

Refraction under hematropine was: O.D., +12.0D. sph. ⌒ −2.0D. cyl. ax. 35° = 20/40; O.S., +10.75D. sph. ⌒ −1.25D. cyl. ax. 90° = 20/40.

On postcycloplegic examination, although the patient was able to obtain 20/40 vision in each eye, she complained of diplopia in the right eye. It was found that, with the undilated pupil, there was a corneal scar, two mm. wide, shaped like a horizontal bar, which bisected the pupil and produced the diplopia. The correction was reduced to: O.D., +8.75D. sph. ⌒ −1.0D. cyl. ax. 45° in order to blur the vision of the right eye so that the disturbing diplopia was eliminated.

This patient was seen by Dr. Alson Braley who stated that he had seen two similiar cases; in one, the eye had to be enucleated and was found to be very small and flattened anteroposteriorly.

Dr. Braley said that in cases of extremely high hyperopia the eyes are very small and show progressive degeneration. They develop the same type of corneal vascularization as seen in interstitial keratitis. When the patient becomes older, retinal detachments, similar to solid detachments, occur. These cases are very infrequent.

A search of the literature showed almost no pathologic description of hyperopia, although there were many reports of the pathologic findings in myopia. According to Dr. Braley, however, this is a definite clinical entity, a degenerative disease of an abnormally short eye.

1820 West Third Street.

FOSTER KENNEDY SYNDROME*

Stanley Masters, M.D.
Brooklyn, New York

In 1909 Paton[1] described a case of frontal-lobe tumor which produced blindness in one eye and papilledema in the other. The nerve-head of the amaurotic eye did not atrophy, however, although tumor compression of the nerve was demonstrated at autopsy. The same report continued the account of a frontal-lobe tumor which produced optic atrophy in the homolateral eye, and papilledema on the opposite side. This would appear to be the first description of a syndrome which has become increasingly familiar to all.

Foster Kennedy,[2] in 1911, recorded six cases which exhibited this phenomenon. Five of these patients suffered from tumors of the frontal lobe, while the syndrome in the remaining case was attributed to an abscess of the frontal lobe. In a subsequent report,[3] he presented a patient with an aneurysm of the right internal carotid artery who presented the same ophthalmic syndrome. Expanding lesions of the frontal lobe had by this time become established as a factor associated with the Foster Kennedy syndrome.

Reports[4–9] were then added to the literature by various authors describing the typical syndrome occurring with intracranial tu-

* From Department of Ophthalmology, The Long Island College Hospital.

mors other than those of the frontal lobe. Cushing[4] reported the syndrome with meningioma of the olfactory groove. Other sites of neoplasms reported as being involved in the syndrome are the quadrigeminal plate,[5] cerebellum,[6] sphenoidal ridge,[7] and the premotor area.[8] However, the Foster Kennedy syndrome remains an extremely valuable sign in localizing tumors of the frontal lobe and olfactory groove.

Yaskin and Schlesinger,[10] in 1942, reported two cases which demonstrated the Foster Kennedy syndrome in the absence of an expanding intracranial lesion. In their first case marked atherosclerosis of the internal carotid vessels produced bilateral compression of the optic nerves and accompanying bilateral nasal field defects. In their second case it was presumed that chiasmal arachnoiditis or aneurysmal dilatation of the internal carotid vessels was the etiologic factor.

In addition, Yaskin and Schlesinger reported on four cases by other authors who attributed the presence of the Foster Kennedy syndrome to vascular sclerosis producing optic-nerve compression.

Tassman[11] reported the Foster Kennedy syndrome resulting from fusiform dilatation of the internal carotid arteries. Montresor[12] reported the Foster Kennedy syndrome in the presence of Paget's disease of the skull.

Case report

The following study of a 52-year-old woman who exhibited the Foster Kennedy syndrome is worthy of notation despite the absence of a definite diagnosis; none of the aforementioned factors could, however, be demonstrated.

The patient had been well until two months prior to admission when she developed severe, intermittent frontal headaches which continued for two months. There was progressive loss of vision, O.D.

When she presented herself at the Eye Clinic of The Long Island College Hospital, the sight of her right eye had been lost except for a small island of vision in the upper temporal field. Vision was O.D., light perception; O.S., 6/30, correctible to 6/9.

The pupils and extraocular muscles were normal. The fundi revealed the findings in a typical Foster Kennedy syndrome with optic atrophy, O.D., and four diopters of papilledema, O.S.

Bilaterally, the vessels were unusually tortuous with mild arteriosclerotic changes. There was complete anosmia of the right nostril.

X-ray studies showed an enlarged sella turcica. Cerebral arteriography failed to reveal any abnormality.

A diagnosis of an expanding intracranial lesion was made and a craniotomy performed.

The right optic nerve was atrophic and reduced to one-third of its normal width. There was also thinning of the chiasm. The area was entirely free of adhesions and it was believed that a chiasmal arachnoiditis had not preceded the atrophy. No intracranial tumor or vascular disturbance was noted. Following surgery the papilledema receded and vision remained unchanged.

Conclusions

A case was presented which exhibited the Foster Kennedy syndrome but for which no etiology could be demonstrated.

The Foster Kennedy syndrome has been observed to occur with the following conditions:

I. Intracranial space-occupying lesions
   a. Aneurysm of internal carotid artery
   b. Meningioma of olfactory groove
   c. Meningioma of falx
   d. Meningioma of floor of anterior fossa
   e. Tumors of frontal lobe
   f. Abscess of frontal lobe
   g. Glioma of intracranial part of optic nerve
   h. Cerebellar tumor

i. Transfrontal extending craniopharyngioma

II. Essentially nonspace-occupying lesions

a. Vascular sclerosis of internal carotid vessels

b. Fusiform dilatation of internal carotid vessels

c. Paget's disease of the skull

Henry, Pacific and Amity Streets (2)

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MALINGERING TEST

EDWARD O. BIERMAN, M.D.
Los Angeles, California

This test is designed for use in difficult cases where the patient is pretending loss of vision in one eye, or partial loss of vision.

The patient's distance correction is first obtained and the patient is given the prescription. The prescription may be in the test frames or spectacles.

Homatropine (five percent) is instilled into the sound eye and saline is dropped into the eye which the patient claims has poor vision. Homatropine is instilled four times, five minutes between drops.

One hour later the patient's vision is again tested. The procedure for testing is:

1. The unsound eye is tested first, for distance and near.

2. The sound eye is tested with glasses for distance. The patient is shown by this test that he can see. He is then asked to read the near card. Because of the cycloplegic in the eye which he claims is sound, his reading will be done with the eye in which the patient claims poor vision.

3. Reading at near indicates the central vision of the "unsound" eye.

The usual precautions for the use of cycloplegics must be observed. This test can be used with variations including the use of a +3.0D. sph. and neutralizing with a −3.0D. sph. while the patient is reading; the use of +3.0D. cyl. ax. 90° and 180°; rotation of the cylinders during reading; and other confusing variations.

The speed and rapidity with which the lenses can be changed, the ease of the test, and the confusing aspect of being able to see at far and not at near, helps the ophthalmologist confuse the malingerer.

Cases of malingering have revealed a large percentage of psychiatric misfits. Neuropsychiatric consultation is obtained immediately after the detection of malingering.

5885 San Vincente.

SOCIETY PROCEEDINGS

Edited by DONALD J. LYLE, M.D.

YALE UNIVERSITY CLINICAL CONFERENCES

November 14, 1952

DR. R. M. FASANELLA, *presiding*

DIABETES AND PHOTOGRAPHY

DR. ERNEST ROSENTHAL (Hartford, Connecticut) presented fundus photographs of: (1) A patient with diabetes of 25 years' duration; (2) unusual pictures of diabetic retinopathies; (3) proliferative retinitis in a diabetic, followed from the beginning to the end stage; (4) diabetic retinopathy followed for six years until shortly before the death of the patient.

Dr. Rosenthal said that the ophthalmoscopic picture of diabetic retinopathy was first described by E. Jaeger in 1856. In 1877, Nettleship examined the eye of a patient and was apparently the first to see and describe capillary microaneurysms. In 1891, Hirschberg classified diabetic retinopathy. He pointed out the difference between the diabetic and nephritic retinopathies, the different clinical findings, and their prognosis.

Diabetics live longer since the introduction of insulin. The complications resulting from vascular degeneration are becoming more frequent.

The survey made by Waite and Beetham of 2,002 diabetics and 457 nondiabetics made it clear that vascular complications are by no means inevitable. In 25 percent of the cases of retinopathy they found no evidence of retinal arteriosclerosis. They concluded that the incidence of arteriosclerosis is no different in diabetics and nondiabetics of the same age group.

Numerous articles confirm this point and point out that hypertension is not an essential factor in the etiology of diabetic retinopathy. There was agreement on the inefficacy of insulin in the treatment of diabetic retinopathy. Despite rigorous control of the diabetes, retinopathy may occur approximately 10 to 15 years after onset of the diabetes in young diabetics and five to 10 years after onset in older diabetics. Only a few diabetics are free from vascular degenerative complications 25 years after the onset of the diabetes.

In 1937, it was suggested that the venous stasis might be a factor in the etiology of diabetic retinopathy. In 1943, considerable interest was aroused when Ballantyne and Loewenstein reported their observations of the unstained retina mounted flat on slides. They proved that the so called "punctate hemorrhages" are, in most cases, microaneurysms which affect the deeper capillary plexus of the inner nuclear layer.

Pictures, which demonstrated the two distinct capillary plexuses, were shown. Microphotographs, which were taken from slides kindly loaned by Dr. J. S. Friedenwald, demonstrated the important findings in diabetic retinopathy made by Dr. Friedenwald. Friedenwald has suggested that lesions similar to those found in the retina might exist elsewhere in the body of the diabetic. He mentions in his Jackson Memorial Lecture that the nodular lesions in Kimmelstiel-Wilson disease might possibly represent occluded capillary aneurysms and might be a manifestation of the same vascular process.

This investigation was continued by Norman Ashton who extended his research to other parts of the eye, to the vessels of the viscera, and to those of the serous membranes. No similar lesions were found. When 79 post-mortem cases, in which no ophthalmoscopic findings were expected, were examined, microaneurysms of the capillary plexus of the retina were found in 23 (29 percent). Ashton writes that in about half,

the microaneurysms were confined to the extreme periphery; they were small and few in number, but often indistinguishable from the diabetic type of aneurysm (Ashton, 1951).

Ashton is in agreement with Friedenwald, who speculated that the mucopolysaccharide proteins within the vessel wall might be involved in the cause of microaneurysms.

The pathology of the aneurysms was shown in more detail with the help of pictures, which were kindly sent by Dr. Ashton. The pictures showed the Indian-ink injection technique used by Dr. Ashton.

Dr. Sysi of the University of Helsinki investigated the incidence of retinal microaneurysms in nondiabetic diseases which also have associated retinopathies. A series of patients with arteriosclerosis, nephrosclerosis, and nephritis were examined. Retinal aneurysms were found in each group. These findings were demonstrated by color pictures taken from slides which Dr. Sysi had kindly sent.

The histogenesis of the microaneurysms in normal and pathologic eyes is still to be explained.

Dr. Rosenthal was introduced by Dr. David Freeman. Preceding and following the meeting, Mr. Lloyd Powell, of the Bausch and Lomb Company, demonstrated the technique of fundus photography and answered many questions about the fundus camera.

Mary Keane,
Secretary, protem.

December 5, 1952

REGENERATION OF WOUNDS AFTER INTRAOCULAR OPERATIONS

DR. BRITTAIN F. PAYNE (New York) reviewed the surgical anatomy in the various areas of the eye in which different operations are performed and emphasized:

1. Consideration of the thinness of the sclera behind the muscle insertions (0.3 mm.) in order to avoid perforation during muscle surgery.

2. The importance of avoiding injury to the long ciliary nerve and posterior ciliary arteries in diathermy operations in retinal detachment. He believes such injuries may explain some of the poor operative results obtained. Similar caution should be observed in scleral resection procedures.

3. Vortex veins may be injured in operations for recession of the inferior oblique.

4. Healing of limbal incisions. The limbus was defined as the area from a line joining the posterior extremities of Bowman's and Descemet's membranes, backward for 0.75 mm. Incision too far forward, with injury to and curling up of Descemet's membrane, may result in temporary or permanent clouding of the cornea in that region.

5. Slides were presented to illustrate healing by primary and secondary intention, as well as nonhealing. It was pointed out that firm wound healing does not occur as rapidly as one ordinarily thinks. One case of diabetes mellitus in which enucleation was done six weeks after cataract extraction showed absence of any healing process. Dr. Payne feels that solid healing of a cataract wound takes three to six weeks.

6. Slides illustrating epithelial downgrowth were shown. The normal epithelial plug at the wound surface had dipped through the wound to form a cyst in the anterior chamber.

7. In some glaucoma cases, when ocular tension is suddenly lost, the lens capsule may rupture, with subsequent clouding of the lens and healing by secondary intention. The pushing forward of lens and vitreous in trephine operations was demonstrated, with herniation of ciliary processes into the trephine wound. It was felt that trephine operations did not work well in hyperopia. One case of sympathetic ophthalmia following iris inclusion operation was shown.

Several cases of chronic glaucoma, in which enucleation had to be performed because of tumor, were shown. Dr. Payne

advised periodic dilation in chronic glaucoma cases so that the fundus could be examined.

Discussion. Dr. Blake agreed that periodic dilation of pupils in chronic glaucoma was desirable. He felt that, with the use of neosynephrine and subsequent miotics, the procedure is not particularly dangerous.

Dr. Freeman believes that the use of corneoscleral sutures does more damage to the eye and causes a more stormy postoperative course, and that this is the penalty paid for the other advantages of this type of suture.

Dr. Wies had not noticed in his experience that wound healing in diabetics was poorer than normal. He also questioned the adverse effect of damaging Descemet's membrane in cataract sections, noting that this damage regularly occurs in total penetrating keratoplasty, frequently without bad results.

Dr. Payne, in answer to various questions by Dr. Glass, Dr. Unsworth, Dr. Rosenthal, and Dr. Clarke, (1) Agreed that, occasionally, posterior synechias can result from prolonged miosis in chronic glaucoma; (2) thought that removal of corneoscleral sutures even two weeks postoperatively still carried the danger of prolapse if the patient sneezed, since the wound was not yet solidly healed; (3) stated that a possible complication of vortex-vein damage was increased intraocular pressure, that damage to long ciliary nerve and posterior ciliary arteries might lead to partial hemiatrophy of the ciliary body and early development of cataract; (4) maintained that diabetics showed more infections and complications and did not heal as well as nondiabetics.

Dr. William I. Glass,
Secretary.

COLORADO OPHTHALMOLOGICAL SOCIETY

October 31, 1952

Dr. Fritz Nelson, *president*

Scientific Meeting

Intraocular acrylic lenses

Mr. Harold Ridley (by invitation) of London, England, spoke on "Further observations on intraocular acrylic lenses in cataract surgery," and reported on all of his cases up to date. He mentioned the difficulties and complications encountered and gave the visual results obtained.

He was most encouraged by the fact that the lens is well tolerated and that the earlier cases are quieter than before. He mentioned that the eye with an acrylic lens is actually stronger and safer than an aphakic eye. This operation does away with all of the disadvantages inherent in the correction of an aphakic eye with unsightly heavy lenses, which give good acuity only through the optical center. On the whole, he was most encouraged and hopeful that his operation will become more popular. In addition to slides, Mr. Ridley presented a movie, showing the technique of this operation.

Methods of fundus examination

Mr. Ridley then read another paper on "Recent methods of fundus examination including the electronic ophthalmoscope."

He traced the development of ophthalmoscopy from the time of Charles Babbage and Helmholtz through the development of the stereoscopic binocular ophthalmoscope and the slitlamp, with the recent advances in the method of examining the fundus as described by Goldmann. New fields of research have been opened by the electron microscope.

In 1949, Mr. Ridley succeeded in televising in color the fundus oculi by utilizing electronic ophthalmoscopy on a cathode ray tube

via a highly sensitive orthicon television camera and a simplified indirect ophthalmoscope.

Clinical meeting

Heredomacular degeneration

Dr. Morris M. Kaplan presented L. B., aged 16 years, who had apparently had normal vision in each eye until two years ago when she began to complain of diminishing vision at both near and distance. This had progressed steadily to date.

Vision was: R.E., 20/60; L.E., 20/40. She could read J3. Refraction revealed minimal astigmatism with no improvement in vision. The only member of the family who had a similar history was one uncle who had had progressive diminution of vision since the age of 10 years.

Funduscopy showed no abnormalities except in the macular area where the central foveal area seemed more injected than normal. This area was surrounded by radial, linear, pigmented streaks about the width of a retinal vessel. The streaks were best seen in reflected light. The findings in both eyes were about the same.

Discussion. Dr. Strong considered the ophthalmoscopic changes degenerative and not inflammatory and suggested field examinations.

Dr. Ridley stated that lately he had obtained considerable information by using slitlamp ophthalmoscopy.

Hemangioma of eyelid

Dr. T. Mc. Van Bergen and Dr. Raymond Mullen presented A. C., a girl, aged 14 months, who had had a mass on her eyebrow since birth. Two weeks ago the growth began to increase rapidly, with slight regression. There were similar lesions on the right scapula and left fingers. X-ray therapy was refused by radiologists and dermatologists because radiation of unknown amount had been administered in Europe six months before.

Examination showed a cutaneous hemangioma above the right brow, and a subcutaneous hemangioma of the right upper eyelid. The globe appeared to be normal without proptosis.

There was no change in the lesions of the scapula and fingers in two months but that of the brow was double in size. The skull X-ray studies were normal.

Discussion. Mr. Ridley advised against injections and against excision and suggested the use of radium needles.

Squamous-cell carcinoma

Dr. J. C. Strong presented B. C. B., a man, aged 24 years, who, about 18 months ago, began to notice a mass in the right eye which gradually increased in size; the increase was accompanied by progressive redness of the eyeball.

After the mass was removed from the conjunctiva and cornea, microscopic examination of a section showed:

Stratified squamous epithelium which changed abruptly to atypical cells. An occasional cell was seen in mitosis; some were undergoing keratinization and showed a horny, pearly formation. Beneath the epithelium, the stroma showed basophilic degeneration. It was not, however, invaded by the tumor cells.

The diagnosis was squamous-cell carcinoma of the bulbar conjunctiva, right eye.

Discussion. Dr. Strong stated that such lesions do not respond to radiation. Dr. Nelson thought otherwise, and Dr. Long felt that these tumors do respond to beta irradiation. Mr. Ridley advised examination by another pathologist and watchful waiting.

Granuloma of iris

Dr. Von Haller Brobeck presented E. M. N., who was first seen in March, 1950, when she complained of progressive pain, photophobia and irritation of the left eye which felt as if there were a foreign body embedded in it. There was deep ciliary injection and generalized opacity of the cornea. Her physician had made a diagnosis of iritis

and instilled atropine. She had had a similar episode in this eye four years previously.

Examination revealed a steamy, edematous cornea. Tension was 45 mm. Hg (Schiøtz). On Descemet's membrane, there were large, mutton-fat keratic precipitates arranged in a typical triangle.

Vision was: O.D., 1.2; O.S., 0.8−.

She was treated for iritis, keratitis, and secondary glaucoma with 10-percent neosynephrine, typhoid H intravenously, and salicylates. Tests for brucellosis and tuberculosis were negative. The tension was promptly lowered.

One month later she developed a dendritic ulcer at the 6-o'clock position, two mm. from the limbus. This was cauterized with iodine, and cleared up promptly with cortisone instillations.

When the patient was seen in June, 1950, a mass had appeared in the stroma of the iris. It was 2.5 by 2.0 mm., circular in outline, and reddish brown in color. The intraocular pressure had risen again, but a 10-percent neosynephrine pack brought it down from 35 mm. Hg to 20 mm. Hg in two hours.

She was not seen again until January, 1952, when a severe headache developed. However, the mass seemed to be the same in size and it appeared to have been dormant since she was last examined.

Discussion. Dr. Nelson suggested a Kahn test and cited a case of overlooked syphilis. Mr. Ridley thought that it might be a tumor, although the iris was not distorted, and suggested a wide iridectomy.

Since this case was presented before the society, further developments have occurred:

Under local anesthesia, a keratome incision was made at the limbus, the iris was grasped, and a synechia was broken easily where it was adherent to the anterior capsule. The immediate diagnosis was an inflammatory mass.

The pathologic report made at Glockner-Penrose Hospital was:

Specimen. Tumor of iris, left eye.

Examination. The specimen is partially fixed in formalin and consists of a brown tissue fragment, 0.15 cm. in diameter.

Microscopic. The surface endothelium has been partially eroded. Immediately subjacent is considerable proliferating granulation tissue in which capillaries, fibroblasts, lymphocytes, and plasma cells can be identified. Golden brown pigment deposits are scattered throughout.

Diagnosis. Granuloma, nonspecific, chronic left iris.

Tuberculosis of eye responding to old tuberculin

Dr. Eli Bard presented a 27-year-old white woman with a history of pulmonary tuberculosis, diagnosed in September, 1951. During January, 1952, she developed a solitary tubercle of the right iris and tuberculous sclerokeratitis of the left eye.

The eye lesions were treated with cortisone and became worse. Treatments with streptomycin and PAS did not give relief. Isonicotinic hydrazid therapy had very little effect on the pathologic condition of the eye. Old tuberculin therapy by the scratch method was followed by rapid healing of both eyes.

Tuberculosis of eye responding to isonicotinic hydrazid

Dr. Eli Bard presented a 19-year-old woman who gave the history of poor vision beginning at the age of 10 years. Three years ago she noticed black spots and lines in front of the left eye and was treated with intravenous iodides. In 1951, a diagnosis of tuberculous chorioretinitis was made. The complete physical examination and laboratory tests were negative.

She was treated with streptomycin and PAS along with cortisone subconjunctivally, with no relief. In July, 1952, she had only light projection in both eyes, with serous retinal detachment of the right eye.

After two weeks of isonicotinic hydrazid therapy, vision in the right eye improved to 20/20−3.

Daniel Franklin,
Secretary.

AMERICAN JOURNAL OF OPHTHALMOLOGY

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THE 1953 SPRING MEETINGS

The 89th annual meeting of the American Ophthalmological Society was held at its favorite place, The Homestead, Hot Springs, Virginia, on May 28th, 29th, and 30th, with 168 members and guests registered. The kindness of the weather, the beauty and peace of the surroundings, and the excellence of the scientific program, which was better than average, combined to make this meeting a cheerful one. Conrad Berens presided with skill.

Of the 21 scientific papers presented and discussed, the ones that appeared to excite the most interest were the papers by (a) Goar and de la Motte on "Cystine crystals in the cornea and conjunctiva," in which the authors pointed out that the presence of crystals in the corneas of infants is pathognomonic of cystinosis; (b) Cogan and Victor who described the "Ocular findings in Wernicke's encephalopathy" (the motion pictures accompanying the paper were most informative); (c) Don Marshall on "Glioma of the

optic nerve as a manifestation of von Recklinghausen's disease," in which the author and Fred Davis, the chief discussor, pointed out that ophthalmologists should be more generally aware of this relationship than apparently they are; (d) Parker Heath who gave a splendid paper on "Essential atrophy of the iris," with convincing histopathologic studies which indicated that the atrophies and distortions are secondary to asymmetrical vascular occlusions; (e) Puntenney and Shock who discussed the "Mechanism of lens injury in radiation cataract," and pointed out the important role that the ciliary body plays in this condition; (f) Reese and Wadsworth on the "Occurrence of cystic spaces in the lens simulating cataract" (this apparently is a hitherto undescribed or at least wrongly interpreted condition easily recognizable by slitlamp studies); (g) Georgiana Dvorak-Theobald on "Glaucoma capsulcuticulare" (this paper was one of the hits of the show); (h) Harold Scheie who described the "Gonioscopic appearance of tumors of the ciliary body: With particular reference to cysts of the ciliary processes," opening up a new field of study by means of the gonioscope; (i) Dunphy, Dreisler, Cadigan, and Sweet on the "Uptake of radioactive phosphorus by intraocular neoplasms," indicated that, with the development of suitable and accurate instruments, this method may prove of great importance in the diagnosis of the presence of intraocular neoplasms.

Finally, the paper by Alan Woods on "Studies in experimental ocular tuberculosis: The effect of isoniazid on nonimmune rabbits" must be mentioned. He showed that isoniazid has a high bacteriostatic rather than a bactericidal action.

At the executive session, Alan C. Woods was awarded the Howe Medal of the society for his meritorious contributions to the science and teaching of ophthalmology. The prolonged applause that followed the presentation was heart-warming evidence of the unanimous approval of the society for the great merit of Dr. Woods' life work in ophthalmology. Arnold Knapp, a distinguished member of this society for 50 years, was elected an honorary member.

William L. Benedict of Rochester, Minnesota, was elected president; Everett L. Goar of Houston, Texas, the vice-president; and Maynard C. Wheeler of New York was most properly reëlected secretary-treasurer. The next meeting will be held at Glacier Park, June 16, 17, and 18, 1954.

The combined meeting of the Section of Ophthalmology, A.M.A., and the Association for Research in Ophthalmology was held in New York the following week. The programs and abstracts of the scientific papers appeared in the April number of THE AMERICAN JOURNAL OF OPHTHALMOLOGY and need no further comment here, except to say that the papers on the whole were excellent and several of them were of unusual merit.

The chairman of the section, Francis Heed Adler, departed from the traditional topics in his address, and gave us a refreshing and important discussion of ophthalmic journalism, particularly pertaining to that in the United States. He emphasized the importance of maintaining the highest standards as a grave responsibility of the editor and said that the easiest way to lose friends is to be an editor.

Prof. A. Franceschetti, the invited foreign guest-of-honor, discussed "Posterior lenticonus," with the first presentation of a histopathologic description of this condition. The Herman Knapp Medal of the section was awarded to Charles K. W. Ascher of Cincinnati, Ohio, for his paper on "Aqueous veins" presented before the section in 1952. The discovery of aqueous veins in 1941 by Ascher has opened up a new field of investigation, particularly in the approach to the glaucoma problem. The Knapp Medal has been seldom awarded. The last time was in 1939 when it was given to Frederick C. Davis for his paper on "Primary tumors of the optic nerve."

The A.M.A. Section on Ophthalmology Medal for distinguished service to ophthalmology was properly awarded to Parker Heath of Boston in recognition of his devotion to the section and for his many scientific contributions.

Members of the section had submitted 12 scientific exhibits, only five of which could be accepted due to lack of space. The exhibits were of high order and created much interest.

The new officers of the section for 1954 will be Trygve Gundersen of Boston, chairman; Dohrmann K. Pischel of San Francisco, vice chairman; and Harold G. Scheie of Philadelphia, secretary. It was decided to continue the combined meetings with the Association for Research in Ophthalmology, which have turned out to be highly successful so far.

The meeting of the Association for Research began on June 1st. The program was lengthy, with 23 papers presented. It is exciting to see the rapid growth of experimental ophthalmology in this country, as witnessed by the large increase in the number of papers and the high quality of the studies. The attendance at both of these meetings was extraordinarily good considering the heat of the weather and the full days of scientific fare.

At the annual banquet of the association on June 2nd, the Proctor Medal for experimental research in ophthalmology was happily awarded to Kenneth C. Swan of Portland, Oregon, for his studies in experimental ophthalmology, especially those pertaining to pharmacology.

The next combined meeting will be held in San Francisco, June 21 to 25, 1954.

Derrick Vail.

THE WILMER MEETING

The 12th clinical meeting of the Wilmer Residents' Association was held in Hurd Hall of The Johns Hopkins Hospital on March 25, 26, and 27, 1953. In the words of Dr. Alan C. Woods, the director of the Wilmer Institute, "The Residents' Association is composed of former senior residents of the Wilmer Ophthalmological Institute of The Johns Hopkins Hospital. Their annual clinical meeting provides an opportunity to review the work done in the Wilmer Institute during the past year, and to follow the activities of the former residents. It has been the custom to invite a number of ophthalmologists from other cities to attend these meetings."

The program consisted of papers on laboratory and clinical research in such proportion and so timed as to whet the curiosity of the visiting ophthalmologists with ancitipation for each succeeding paper. All presentations were made with typically Wilmer precision and acumen.

Dr. Alan C. Woods presented the opening paper on "Diagnostic and therapeutic use of specific streptococcus vaccine." Of patients having nongranulomatous uveitis, 80 percent show streptococcus bacterial sensitivity, whereas only 20 percent of those with granulomatous uveitis show such sensitivity. Organisms are rarely recovered from eyes with nongranulomatous uveitis, whereas, the exciting organism can often be isolated in cultures or found in microscopic sections of eyes of patients with granulomatous uveitis.

Desensitization with streptococcus vaccine was found to be the most effective means of controlling the disease in certain instances, further indicating an etiology of bacterial sensitivity. Desensitization is achieved by intravenous injection of 0.1 cc. of 1:1,000, T50 (turbidity standard) dilution, every four days, the dose being gradually increased. There was experimental evidence that intravenous injection of antigenic bacteria desensitizes better than either intracutaneous or subcutaneous injection. If foci of infection are found, vaccines from these are made for the desensitization. This paper should be published soon and should be on everyone's agenda for careful reading.

A second paper by Woods, Becker, and

Wood dealt with the effect of isoniazid in ocular tuberculosis. If this drug is administered coincidentally with introduction of infection, the animal remains symptomless until two weeks after cessation of use of the drug and then the signs of infection appear. These findings indicate that isoniazid does not destroy the tubercle bacillus but simply inhibits its growth during the period of drug administration. Organisms develop resistance to the drug and, for this reason, in clinical use it must be used in combination with streptomycin, dihydrostreptomycin, and para-aminosalicylic acid.

A corollary to this paper was that of Dr. Angus L. MacLean. He presented five cases of neuroretinal periphlebitis, all showing negative uveitis surveys, including tuberculin tests, that responded miraculously to isoniazid given in desperation as a final therapeutic resort. Some of these cases showed the presence of Landers vitreous nodules which are supposedly specific for sarcoid. The interpretation by Dr. MacLean was that these nodules are not pathognomonic for sarcoidosis.

Dr. Charles E. Iliff described a simplified ptosis operation. In his procedure a Berke ptosis clamp is inserted through a stab incision on the under side of the inverted lid, temporally and above the tarsus. The incision is made through to the orbicularis so that the blade of the clamp is introduced between the levator and the orbicularis so as to include the conjunctiva, Müller's muscle, and the levator. The tarsus is then cut three mm. distal to its upper border and the apron of tissue held in the clamp is then freed, advanced, and resected, sutures having first been placed through the tissue 10 mm. above the tarsal edge. Thus, 13 mm. of tissue, including the conjunctiva, Müller's muscle, levator, and tarsus are resected.

Residents Becker and Hoover corrolated recent tonographic studies on aqueous outflow and intraocular pressure with simultaneously determined blood-pressure readings automatically recorded. They conclude that the initial rapid fall on the tonographic tracing may be the result of blood-pressure change and not related to aqueous outflow. This interpretation indicates a possible source of error in evaluating the usual tonographic record. The effect of pregnancy and of the menstrual cycle was also studied and results indicate possible beneficial effect from use of progesterone in the treatment of certain types of glaucoma. Diurnal variation and other factors altering rate of aqueous outflow are yet to be determined.

Dr. Howard Naquin reviewed Wilmer statistics on the effectiveness of exenteration of the orbit in controlling malignancies in this area. He recommended earlier interference and more radical procedures such as removal of the accessory sinuses when the least indication exists because the recurrence of malignancies is so frequent and the prognosis is so poor in these cases. A split-skin graft is used for lining the orbit after granulation tissue becomes apparent.

Dr. William Marr showed that the newer antibiotics do not materially affect regeneration of corneal epithelium.

Intern Dr. Carl Kupfer reported that hypercementosis, thickening of the cementum around the dental roots, is common and demonstrable in thyrotoxicosis, but that in cases of thyrotoxicosis associated with malignant exophthalmos this finding is absent, the cementum appearing to be normal. If this report is verified, a valuable sign has been added to our diagnostic armamentarium in differentiating thyrotoxic from thyrotropic states.

Wood, Becker, and Woods summarized their results on experimental ocular brucellosis. The brucella organism was less sensitizing than the tubercle bacillus, the lesions showing less evidence of sensitivity factors than those seen in tuberculosis. Cortisone may appear to lessen the minor reactions but it definitely worsens the underlying disease.

On the second day of the meeting, Russell and Guyton opened the session with a discussion of their experience using xylo-

caine in retrobulbar anesthesia. The anesthetic properties of xylocaine were superior to those of novocaine but the orbital edema occasionally encountered with xylocaine may prove to be the deciding factor against the use of this drug for retrobulbar injection.

The ocular signs of poliomyelitis were considered by Dr. Frank Walsh and Dr. Robert G. Murray. They particularly noted that the visual pathways are not affected and the eye muscles but rarely affected, presumably because there are more nerve fibers per number of muscle fibers in eye muscles than in skeletal muscles. The pathology of poliomyelitis was reviewed in detail.

An impressive series of papers on diabetic retinopathy from Dr. Jonas Friedenwald's laboratories followed. Dr. Friedenwald presented evidence that diabetic retinopathy is influenced by adrenal function. Oxysteroid and cortisonelike substances are put out in excess in diabetics with retinopathy. Lesions simulating those found in Kimmelstiel-Wilson disease were produced in 33 percent of the rabbits to which cortisone alone was given, in 75 percent of alloxan-diabetic rabbits given cortisone, and in 100 percent of cortisone-treated alloxan-diabetic rabbits with B_{12} vitamin deficiency.

Pantothenic acid and related vitamins improved the adrenal function in diabetics as judged by the greater eosinophilic response to ACTH following use of these vitamins.

Diabetics without retinopathy appear to have a tendency to B_{12} deficiency. Diabetics with retinopathy show what seems to be a contradictory increase in excretion of B_{12}, but this is presumably due to excessive functioning of the adrenals in the diabetic, mobilizing all available vitamin B_{12}, thereby masking a relative deficiency of this substance.

Testosterone dampens pituitary and adrenal function, and therefore lessens the excretion of vitamin B_{12} and in this way may help a diabetic retinopathy. Presumably B_{12} deficiency and increased adrenal function increases diabetic retinopathy. In correcting this, one would recommend use of B_{12}, but clinical experience with this treatment to date has been discouraging.

The Department of Neurophysiology of the Wilmer Institute presented an interesting session on eye movements. This department is under the brilliant direction of Stephen W. Kuffler who was ably assisted by Horace B. Harlow and Lorrin Riggs, visiting professor of psychology.

Voluntary movements of the eyes to one side are not smooth movements but show considerable cog-wheel rigidity. Voluntary fixation is always associated with fine involuntary movements of variable magnitude, in the neighborhood of 10 seconds of arc. The goal these physiologists set for themselves was to determine whether or not the fine fixation movements actually enhance or diminish visual acuity.

A most ingenious apparatus was devised by Dr. Riggs with which the fixated letter could be made to move exactly with eye movement, the same percipient cells being stimulated always, creating the same effect as absolute lack of movement. This was accomplished by use of a mirror contact glass, a mirror source, and another mirror into which the image fixated was reflected in unison with the eye movement.

With this apparatus, the investigators found that eye movements lessen acuity if exposure to the object of regard is extremely brief, but that if exposure is sufficiently long to allow retinal adaptation the movements enhance the visual acuity. The eye can be likened to a camera where movement of the camera would blur the image unless perchance the film has become less sensitive because of breakdown of photochemical substances in which case movement to a more sensitive part is necessary for more acute interpretation.

A motion picture demonstration of "Neurological disorders of ocular motility" by John M. McLean and a paper on "Accurate diagnosis of early malignant melanoma of the choroid," by Benjamin Rones completed

the interesting program for that day.

The following morning Dr. P. Thomas Manchester, Jr., showed beautiful films of the orbit as outlined by injection of Diodrast. The substance is very irritating unless preceded by hyaluronidase. The orbit is injected with novocaine and hyaluronidase (50 units) followed by 3.0 cc. of 35-percent Diodrast. The demonstration indicated that orbital tumors and other pathologic conditions of the orbit can be better visualized by this innovation in technique.

Assistant resident Tillett reviewed the statistics on traumatic hyphema and found subsequent glaucoma to be proportional to the amount of hemorrhage. Patients can have complete loss of light projection and recover completely. Recurrent hemorrhage was encountered in 50 percent of the cases operated on to relieve the glaucoma. In the discussion of this paper, Dr. Iliff referred to a case in which he stopped the bleeding from the base of the iris by catching the base in a suture, as is done in the repair of cyclodialysis. The consensus was that if no glaucoma follows the initial hemorrhage the eye should be left alone, but if glaucoma ensues or there are repeated hemorrhages, repeated irrigations are warranted.

Louise Sloan showed how aniseikonia increases the error in judging the Howard-Dolman test. Roy O. Scholz added another paper to his series on secretion and excretion of aqueous as determined by use of radioactive salts.

The final paper of the session, by Frank B. Walsh, was entitled "Calcium in neuro-ophthalmological diagnosis." Placing this masterful clinician's paper last was a certain way of holding the audience to the conclusion of the program. This splendid review contained many example cases of calcium disorders from Dr. Walsh's vast personal experience. In hyperparathyroidism, he has seen deposits of calcium crystals in the cornea. Vitamin-D intoxication can give symptoms of hyperparathyroidism, and it can be simulated as a result of excessive alkali intake in the treatment of ulcer. In the presence of band keratitis one should keep hypercalcemia in mind.

Dr. Walsh touched upon cases with hypocalcemia, as infantile hypoparathyroidism, idiopathic hypoparathyroidism which responds well to treatment, and pseudohypoparathyroidism in which the end-organ is less responsive than normal, but the blood calcium is normal. These cases are benefited by increased vitamin-D intake.

Dr. Walsh particularly emphasized a syndrome in children of increased sensitivity to light and blepharospasm, corneal clouding, and vascularization simulating to a degree phlyctenulosis, which results from hypocalcemia and which responds extremely well to correction of the hypocalcemia. He mentioned cases of latent tetany in which there is no spasm and yet the blood calcium is low. These may show psychosis, papilledema, and calcification of the basal ganglion as seen by X-rays. Finally, he showed the typical calcification of the skull seen in Sturge-Weber syndrome. Dr. Walsh should be encouraged to publish these observations and his interpretations of them as a monograph.

Attendance at this annual meeting is a stimulus to any ophthalmologist, be he investigator or clinician, because the director of the institute and those who plan the program with him possess a superior combination of research and clinical ability.

S. Rodman Irvine.

SPECIAL REPORT*

Fish lens protein

On September 12, 1952, there appeared in *Science* an article by R. F. Shropshire, Jacob R. Ginsberg, and Mendel Jacobi[1] reporting beneficial effects from the nonsurgical treatment of cataract with injections of fish lens

* This report was prepared by the Committee on Ophthalmology of the Division of Medical Sciences of the National Research Council and was originally published in the *Journal* of the American Medical Association (152:707, No. 8, June 20, 1953).

protein. Because of the widespread public interest that it aroused and because of the inadequacy of the evidence presented, the Council of the American Academy of Ophthalmology and Otolaryngology petitioned the National Research Council to investigate the authors' claims. An investigation was made by the National Research Council Committee on Ophthalmology, whose findings and recommendations form the basis for this report.

The hypothesis that lens antigens might be useful in the treatment of cataract is not new. In 1908, Römer[2] reported success in treating cortical cataract with tablets of mammalian lens protein. In 1923, Davis,[3] in this country, attempted active immunization with bovine lens material. The latter's favorable reports led to a number of other investigations.[4] These, however, failed to confirm Davis' findings, and the proposed therapy lapsed into obscurity.

The use of fish lens protein was attempted in 1933 by Lewis,[5] with whom its present proponent, Mr. R. F. Shropshire, was then associated. Again favorable results were claimed but the ophthalmologic details presented were unconvincing, and the report aroused little interest on the part of the profession.

Mr. Shropshire's interest, however, continued, and in 1937 he published two papers[6] on the subject. In addition to reviewing Lewis' work, he cited a paper by Hektoen and Schulhof[7] as evidence that the lens proteins of fish are immunologically different from those of mammals. In fact, these authors had specifically stated that fish lens contains antigens that interact with mammalian lens, in addition to others that are species specific. Shropshire also reported chemical differences between piscine and mammalian lenses; being able to account for only a part of the sulfur content of fish lenses, he postulated the existence of a previously undescribed sulfur-bearing amino acid of therapeutic value. Unfortunately his analytical methods were not suitable for the detection of either cystine or methionine; the latter alone accounts for about half of the sulfur present, and cysteine and cystine almost completely account for the rest.[8]

The chemical argument is extended in the recent paper of Shropshire, which reports that differences were found between the electrophoretic and ultracentrifugal patterns of mammalian and piscine lens proteins. According to the detailed report furnished the committee, these studies were performed by Dr. Kurt G. Stern with human and piscine lenses. Since the patterns of bovine and human lens proteins are also very different from one another, the observations of Stern do not support Shropshire's claim that fish lens has distinctive qualities of possible therapeutic value. In any case no deductions as to antigenic behavior can be made legitimately from physico-chemical measurements of the type described.

The article in *Science* is chiefly notable for its reports of the successful treatment of cataract in rats and humans with injections of fish lens protein. On investigation, it developed that cataracts had been induced in the rats by feeding them galactose. Since such cataracts appear superficially to clear when the administration of galactose is stopped regardless of treatment, these observations do not provide convincing evidence in favor of the fish lens therapy.

The most impressive claim was that of improved visual acuity in the patients treated by Shropshire's co-authors, Dr. Ginsberg and Dr. Jacobi. The article referred to an initial group of 14 patients, described in general terms, and an additional 12 whose acuities before and after treatment were given in a table. In order to provide an independent evaluation of these claims, arrangements were made to have a subcommittee of the Committee on Ophthalmology examine a group of patients selected by the proponents of the therapy. Eleven patients were examined, all of whom were enthusiastic about the benefits that they had obtained. The findings were compared with those recorded

when the treatment was begun. In six patients the visual acuity was less than before treatment, and the cataracts appeared to have progressed steadily in the usual fashion. Two others showed little or no change. Three showed slight or questionable improvement; two of these had vitreous opacities, and their subjective reports clearly supported the conclusion that the improvement had been due to shifting of these opacities out of the line of vision. In only one patient did the data appear to suggest an actual improvement; since, however, neither Shropshire nor his collaborators were ophthalmologists, their original estimate in this case may have been in error.

The subjective improvement, in most cases, was in near vision; the obvious explanation of this is the development of functional myopia in a progressing cataract. Two patients, as mentioned, were pleased because their vitreous opacities seldom bothered them, and another because his sensitivity to light and multiple vision when looking at lights had disappeared. With the possible exception of one patient, therefore, there was no evidence that the normal course of the cataracts had been affected by the treatment.

A later report received by the committee described the results of treatment administered independently by an ophthalmologist on the staff of a recognized medical school, using fish lens protein supplied by Mr. Shropshire. The cases were unselected, and included 14 eyes with cataracts in nine patients. No objective change in the cataracts could be discovered; in four cases vision as measured by the test chart was slightly improved, while in two it was worse. Seven patients reported subjective improvement, which the physician considered to be psychologic; one felt that she was worse.

Further evidence indicates that treatment with foreign lens proteins is not merely ineffective but also hazardous to the patient. Posner[9] has recently called attention to serious reactions, leading in one case to total blindness, in patients sensitized to their own lens protein by injections of both beef and fish lens extracts; he warned ophthalmologists of the dangers that may arise when such patients come to operation. This was corroborated by a member of the committee, who referred to the unfortunate postoperative histories of patients treated unsuccessfully with beef lens protein. It should further be noted that of 12 sample bottles of the fish lens preparation furnished to the Ocular Research Unit of the Walter Reed Army Hospital by the Cataract Institute, 10 were contaminated with pathogenic organisms.

The committee also inquired into the backgrounds and qualifications of the proponents, to determine how much credence might be given to their reports. No evidence was found that Mr. Shropshire had any formal scientific training; claims that he was a graduate physician and had conducted research in ophthalmological chemistry at two universities were not substantiated by the institutions concerned. He has, however, tried his hand at a variety of scientific undertakings. As noted above, he was an assistant to the late Dr. F. Park Lewis, an ophthalmologist, about 1933, at which time he published a paper on the eye of the trout. Subsequent activities included two appointments as a laboratory technician in pathology, from which he was dismissed for lack of competence and for unreliability due to drug addiction, and brief experience in research in underwater sound. In 1944 he posed as a pathologist in Florida and, after pleading guilty on three counts of forging prescriptions for narcotics, was sentenced to serve five years on the first count and five on the second, the sentences to run consecutively. About one year later he was paroled. This parole was revoked in 1948; excessive use of alcoholic drinks, suspected use of narcotic drugs, and issuing of bad checks were given as the reasons. It was following a second parole in 1949 that he engaged, with private sponsorship, in his recent studies on experimental cataract in the rat.

In a chance meeting with Shropshire, a

New York business man, Mr. Saul Gaynes, became interested in the financial possibilities of the fish lens preparation. Clinical trials were begun by his brother, Dr. Ginsberg, a general practitioner, and Dr. Jacobi, an internist. Encouraged by the early reports, Gaynes and Shropshire incorporated the Kortright Industries to manufacture and sell the preparation. With three others they also established the Cataract Institute, as a nonprofit corporation to conduct research on the pathogenesis and therapy of cataract, and Shropshire was given a five-year contract as consultant. A third physician later joined the group, Dr. Jacob Weynert, an orthopedist. For a time patients were examined by opticians in the employ of a New York optical company.

In summary, the committee found nothing in the theoretical background or in the experimental and clinical results of this therapy to recommend it. It did, however, find evidence that the treatment might seriously interfere with the subsequent surgical removal of the cataracts that it had failed to cure. In view of these facts, the committee adopted the following statement of its conclusions:

"Because of the total lack of evidence that the lens antigen treatment of cataract described by Mr. R. F. Shropshire (*Science*, September 12, 1952) has any efficacy; because adequate evidence is now available to the committee that it is, in fact, without demonstrable efficacy; and because treatments of this type have been thoroughly investigated in the past and proved not only invalid but potentially dangerous to the patient; this committee does not recommend further investigation of this treatment by any agency."

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XVII INTERNATIONAL CONGRESS OF OPHTHALMOLOGY

September 13 through September 17, 1954
New York City
Waldorf-Astoria Hotel
Subjects for discussion: *Glaucoma* and *Uveitis*

CORRESPONDENCE

Correction

Editor,
American Journal of Ophthalmology:

In The American Journal of Ophthalmology for March, 1953, under "Society Proceedings," page 393, there occurred an error in the transcript of my discussion on the remarks of Dr. Chang.

The report stated that I said that 2.0 r will produce corneal opacities in the labo-

ratory animal. This is not correct. What I said was:

"Single, direct exposure of the rabbit's eye to 550-980 r of the same quality of X rays will cause cataract. In recent experiments of Cogan, lenticular opacities were observed in the rabbit after the eyes had been exposed to 250 r of a more penetrating roentgen radiation, and after the observation time was proportionately prolonged. In consideration of the fact that the human eye is about twice as sensitive to X-ray irradiation as the rabbit's eye, I wonder whether any cataracts were observed in patients who were irradiated for malignant exophthalmos according to the technique described. What was the observation period?"

I would appreciate it if you would publish this as soon as convenient in order to rectify the false impression created by the report of my remarks.

(Signed)

Ilona Krasso deSuto-Nagy, M.D.
New Haven, Connecticut.

BOOK REVIEWS

OPHTHALMIC PATHOLOGY: An Atlas and Textbook. By Jonas S. Friedenwald, M.D., Helenor Campbell Wilder, A. Edward Maumenee, M.D., T. E. Sanders, M.D., Michael J. Hogan, M.D., W. C. Owens, M.D., and Ella U. Owens, M.D. Published under the joint sponsorship of the American Academy of Ophthalmology and Otolaryngology and the Armed Forces Institute of Pathology. Philadelphia, W. B. Saunders Company, 1952. 489 pages, with 240 plates. Price: $18.00.

This book is the product of good coöperation and teamwork. American ophthalmologists throughout the land have contributed specimens and records during the past 30 years to the Registry of Ophthalmic Pathology. These specimens have been prepared, studied, coördinated, and indexed by the past and present staffs of the Armed Forces Institute of Pathology. They have subsequently been interpreted and integrated by a group of experts in ocular pathology, including the incomparable Jonas Friedenwald with a team composed of Mrs. Helenor C. Wilder, Dr. A. E. Maumenee, Dr. T. E. Sanders, Dr. John E. L. Keyes, Dr. Michael Hogan, Dr. W. C. Owens, and Dr. Ella Owens. Throughout its preparation this book has had the loving editorial care of Mrs. Helen Knight Stewart. The work has been carried out under the supervision of the Committee on Revision of Pathological Atlases appointed by the American Academy of Ophthalmology and Otolaryngology whose able chairman was Dr. Brittain Payne. It is appropriate that this book should be published under the aegis of the American Academy of Ophthalmology and Otolaryngology which organization, through its far-sighted executive secretary, Dr. W. L. Benedict, squired the first Registry of Pathology, that for ophthalmology, from which this volume sprang.

This is a beautifully presented book which elevates ocular pathology to something more than mere morbid anatomy and the recitation of structural changes. It deals also with pathogenesis and relates pathology to the other basic sciences. In the chapter on the lens (Chapter XI) the chemistry involved in cataract formation is elaborated; in the chapter on diseases of the conjunctiva and cornea (Chapter X) the bacteriology, immunity, and allergy concerned are discussed; and in the chapter on glaucoma (Chapter XII) and elsewhere (Chapters I, II, and XIV) pertinent physiology is given when it helps clarify the issues.

Furthermore, this book furnishes the liaison between ocular pathology on the one hand and general pathology and systemic diseases on the other. It gives the newer concepts of general processes such as the nature and mechanism of inflammation and repair (Chapter IV). The question of etiology is sometimes mentioned such as in the case of chronic endogenous endophthalmitis

(Chapter V) where, after discussing the morbid changes, details regarding the pathogenesis of the disease are given. Animal experimental pathology is quoted in many places where it will help explain pathologic processes. Most important is the fact that the clinical application and significance of pathologic changes are stressed.

The illustrations are superb. It is difficult to conceive of their being better either technically or in their selection. The illustrations are grouped at the end of each chapter and no reference is made to them in the text, a feature which might have been incorporated to advantage. As a matter of fact, the illustrations out-strip the text occasionally. For instance, there is one page showing foreign bodies of cotton fibrils in operative wounds, and one page showing the epithelization of the anterior chamber and implantation cyst, neither of which subjects is mentioned in the associated chapter. None of the illustrations are in color, and, although this is understandable, there are a number of conditions depicted in which color is essential to show the changes.

Any book of composite authorship lacks uniformity of quality, some chapters being better than others. Also, such a work must suffer to some degree from a lack of integration. In this book the majority of chapters are excellent, but there naturally exists some repetition, some disagreement in pathologic findings and their interpretation. For example, in Chapter IX on extrabulbar diseases, the anatomy is reviewed and tumors are discussed even though both these items have been included elsewhere in the volume.

Criticisms of this book are limited to minor features. There are included some statements which seem to be the views of individual authors and not those held by many, such as the existence of a vasomotor endophthalmitis and the presence of pigment around the periphery of inactive areas of choroiditis being due to the deposit of phagocytosed melanin rather than to proliferation of the pigment epithelium. Also, where there is a paucity of pathologic material, such as in the subject of iritis, the author resorts entirely to a clinical description of the disease (hypopyon uveitis in Chapter VI).

There are some omissions. In the chapter on anomalies no mention is made of iris processes, pigmentation of the lamina cribrosa, retinal dysplasia, or intrascleral nerve loops.

In the chapter on injuries, retinitis sclopetaria, recession, and inversion of the iris are not mentioned.

In the chapter on glaucoma, the cause of narrow-angle glaucoma is given as a vasomotor crisis in the ciliary processes and the question of physiologic pupillary block or bombé is not mentioned.

Not cited in that portion dealing with detachment of the retina are vitreous shrinkage, retinal contraction after a long-standing detachment, ring schwiele, and the occurrence of secondary holes or breaks in detachments.

There has been a great need for a comprehensive, up-to-date, authoritative, well-illustrated treatise in English on ocular pathology. This is it. Thanks are due to many people for making this superb book possible, but it would be amiss not to single out Dr. Jonas S. Friedenwald and Mrs. Helenor C. Wilder for an especial nod of appreciation.

Algernon B. Reese.

Syphilitic Optic Atrophy. By W. L. Bruetsch. Springfield, Illinois, Charles C Thomas. 138 pages. Price: $5.50.

This number 142 of the American Lecture Series is concerned primarily with the pathology and pathogenesis of syphilitic optic atrophy although clinical symptoms, treatment, and prevention are also discussed.

After a brief introductory chapter in which it is noted that 10 to 15 percent of blindness is caused by syphilis, the earlier hypotheses are discussed and criticized. This discussion is followed by the author's cases,

reported in great detail and illustrated by excellent photomicrographs. This material supports the conclusion of Léri that syphilitic atrophy of the optic nerves is always due to an interstitial neuritis.

The theory of Abadie that the degeneration is due to vascular spasm from sympathetic involvement, the theory of Lauber that the cause is retinal hypertension, the theory that optochiasmatic arachnoiditis is the cause, and the theory of vitamin deficiency are all shown not to be in accord with the known facts.

The inflammatory process is in the intracranial portion of the optic nerves and in the chiasm and the degeneration of the nerve fibers is secondary to it. Bruetsch bases his conclusions on the examination of the optic pathways of 80 patients, 57 with general paresis or taboparesis, three with tabes dorsalis, and 20 with meningovascular syphilis.

The author shows that the clinical findings agree with the microscopic findings that the atrophy begins in the intracranial portions of the optic nerves, chiasm, or both. The first sign of syphilitic optic atrophy may be constriction of the fields for white and color, while the central vision is relatively intact. Treatment with penicillin is advised and the author is of the opinion that intraspinal administration has no advantage and may be dangerous. For prevention, routine repeated examinations of visual fields, fundi, and acuity are advised in every patient with acquired or congenital syphilis.

This little book should settle once and for all the question of the nature and cause of syphilitic optic atrophy. It is clearly and logically written, printed on excellent paper with large clear type. It should be in every library.

P. Bailey.

LE CHAMP VISUEL. Topographie normale et pathologique de ses sensibilités. By A. Dubois-Poulson (with the collaboration of P. François, A. Tibi, and Cl. Magis). Paris, Masson et Cie., 1952. 1175 pages, 820 figures, four plates in color, bibliography, table of contents. Price: 6,500 francs.

The subtitle of this magnificent book discloses the point of view in studying the visual field that the author considers important. A visual field is the record of a study of the topography of thresholds of perception throughout the visible area, not merely the determination of the peripheral limits beyond which the eye is blind. Adequate interpretation of the findings can only be based on extensive knowledge of the anatomy and physiology of the tissues concerned with vision and of the technical methods of gathering data. Without detailed exposition of these principles, a mere atlas of records of fields which were of diagnostic help in patients with various lesions of the eye or the visual tracts would be valueless.

The book is divided into two sections.

In the first section of 407 pages the physiology of the visual sensations and the anatomy of structures and their blood supply are discussed. Here the theoretical basis for the normal topography of visual sensitivity is discussed—character of stimuli, the idea of threshold, adaption, time factor, the isopters, fusion and flicker perimetry, color perception and thresholds, form sense, the normal scotomas, binocular field, the pupil, the electroretinogram, and the electroencephalogram. In the anatomic portion, the retina, tracts and cortex and their blood supply are described and the correspondences between anatomic and perimetric data are evaluated.

In the second section the instruments and methods for clinical field taking are described in detail. Many models of perimeters and other instruments are evaluated. The findings that are associated with lesions in each of the tissues which is important in vision are considered systematically and the clinical significance of characteristic field defects is analyzed.

Numerous excellent figures are records of

actual observations which support the author's statements. There are also pictures of various instruments, and the figures which illustrate the relation of fiber bundles to areas in the field are particularly instructive. In the extensive bibliography (74 pages) the references for each chapter are arranged alphabetically.

Despite the fact that excellent books exist in English, German, and Spanish, this one is far from superfluous in the areas in which these languages are used. This book will doubtless be a much used work of reference, but it will be a pity if it is not widely read from cover to cover. Had the author written a less fascinating book he would have had his review much sooner.

F. H. Haessler.

TRANSACTIONS OF THE OPHTHALMOLOGICAL SOCIETY OF LOMBARDY. Volume 6, 1951.

The first session of the society, held in April, was mostly dedicated to a symposium on amblyopic and blind children. D. Cattaneo discussed the importance of sight-saving schools. L. Maggiore analyzed the causes of infantile blindness. In 20 percent, a trauma caused the visual defect; in 17 percent, an atrophy of the optic nerve; and in 14 percent, hydrophthalmus. (Retrolental Fibroplasia has not yet appeared as a major cause for blindness in children.)

L. E. Grancini discussed various methods and ways to treat amblyopic children. He especially mentioned the operations for congenital cataract, keratoplasty, and goniotomy. A. Wirth emphasized the psychologic problems of these children. G. F. Carlevaro spoke about the prevention of amblyopia ex anopsia. These children should be treated in nurseries and kindergartens. O. Benesch discussed pedagogic problems in educating amblyopic children and G. Turchetti spoke about the blind and the amblyopic in school and society.

Among other problems discussed at that session was the extraction of a clear lens in patients with high myopia. M. Valerio practices the intracapsular extraction in such cases; to date 30 eyes have been operated on. No patient was younger than 38 years. Vitreous was lost in two cases only and only one eye was lost because of a late infection. F. L. Candian on the other hand reports on follow-ups of 14 eyes operated on according to the original method of Fukala (discussion). Four patients had a retinal detachment, two of which were successfully treated.

C. Koch reported on the determination of the viscosity index of ocular fluids. He uses a micromethod with photographic recordings. D. Montresor presented a case of Foster-Kennedy syndrome caused by Paget's disease.

During the June session, E. Grancini discussed ocular changes after transorbital lobotomies. This operation, introduced by Freeman and by Fiamberti, does not injure the ocular system if the instrument is introduced in front of the lids. The only changes observed are variations in the blood pressure of retinal arterioles.

Most of the November session was dedicated to medicolegal questions, especially to the various aspects of compensation after eye injuries and eye diseases.

C. Koch reported studies on the vitreous fibrils, their elasticity and tensil strength.

Frederick C. Blodi.

ABSTRACT DEPARTMENT

EDITED BY DR. F. HERBERT HAESSLER

Abstracts are classified under the divisions listed below. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. Anatomy, embryology, and comparative ophthalmology
2. General pathology, bacteriology, immunology
3. Vegetative physiology, biochemistry, pharmacology, toxicology
4. Physiologic optics, refraction, color vision
5. Diagnosis and therapy
6. Ocular motility
7. Conjunctiva, cornea, sclera
8. Uvea, sympathetic disease, aqueous
9. Glaucoma and ocular tension
10. Crystalline lens
11. Retina and vitreous
12. Optic nerve and chiasm
13. Neuro-ophthalmology
14. Eyeball, orbit, sinuses
15. Eyelids, lacrimal apparatus
16. Tumors
17. Injuries
18. Systemic disease and parasites
19. Congenital deformities, heredity
20. Hygiene, sociology, education, and history

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CONJUNCTIVA, CORNEA, SCLERA

François, Jules. **Heredofamilial corneal dystrophies.** J. genet. hum. 1:103-138, Sept., 1952.

Clinical, genetic, and histologic studies prepared the author to describe the various heredofamilial corneal dystrophies. He recognizes two large groups: 1. the isolated or idiopathic forms and 2. the degenerations associated with thesaurismoses. 1. The isolated lesions may be parenchymatous, near the delineating membranes, or combined forms. The parenchymatous lesions may be a. congenital and stationary or b. tardive and progressive. In this group one finds not only the three classical forms with dominant or recessive heredity, but also crystalline degeneration, primary fatty degeneration, dystrophia calcarea, cornea farinata (Vogt), and dystrophia filiformis profunda corneae (Maeder and Danis). The degeneration of the limiting membranes occurs a. in the epithelium or Bowman's membrane or b. in the endothelium or Descemet's membrane. The anterior lesions are hereditary, recurrent corneal erosion (Franceschetti), dystrophia epithelialis (Meesman), a similar lesion reported by Kraupa, dystrophia annularis (Bückler's), cornea verticillata (Fleischer), mosaic corneal opacity (Vogt), and band-shaped keratopathy. The posterior lesions are posterior polymorphous degeneration (Forni) and cornea guttata (Vogt). A third or combined form is represented by dystrophia epithelialis (Fuchs).

The degenerations which occur with thesaurismoses are those that occur with gargoylism, amaurotic family idiocy (Tay-Sachs), Schiller-Christian disease, cystin diathesis, and as part of the dermochondrocorneal syndrome. The latter is characterized by superficial central subepithelial opacities of various size, an osteo-chondral dystrophy in the distal portions of the upper and lower extremities, and cutaneous xanthomata on the dorsal surface of the fingers, the posterior surface of the elbow, and in the region of the nose and ears. F. H. Haessler.

Jaensch, P. A. **Virus keratitis.** Deutsche med. Wchnschr. **78**:429-431, March 27, 1953.

Jaensch summarizes the data on the epidemic occurrence along the lower Rhine and in the Ruhr area of a conjunctival and corneal infectious disease which is characterized by follicles, nummular infiltrates, and lymphadenitis, and compares them with those of similar diseases in other years. F. H. Haessler.

Kojima, K., Niwa, Y., Inamie, E., and Yoshino, M. **Ocular symptoms of epidermolysis bullosa dystrophica.** Acta Soc. Ophth. Japan **57**:163-165, March, 1953.

In a 37-year-old woman a spontaneous perforation of the sclera was followed by an exposure and prolapse of the choroid in both eyes and an infiltration and leucoma of the cornea, iridocyclitis and secondary glaucoma in the left eye.

Yukihiko Mitsui.

Latte, B. **Trachoma therapy with terramycin.** Boll. d'ocul. **31**:769-773, Dec., 1952.

A one-percent ointment of terramycin, four times a day, and, for the fellow eye, one-percent solution of terramycin was used in the treatment of 25 children with recent trachoma for eight weeks. Six others received oral terramycin beginning with three daily doses of 250 mg. for 10 days followed by one week without treatment and repeated until 25 grams of the drugs were given. Five adults with cicatricial trachoma and pannus received the ointment six times daily for three weeks. While follicles and papillary hypertrophy proved rather resistant, encouraging results were obtained when the one-percent terramycin ointment was used. (References) K. W. Ascher.

Pillat, A. **Epidemic keratoconjunctivitis (1938) in Vienna.** Wien. klin. Wchnschr. **65**:41-43, 1953.

A resurgence of the epidemic of keratoconjunctivitis occurred in Vienna in the fall of 1952. Pillat observed 217 cases within 40 days. In 55 percent of the patients the cornea was involved. The author was successful in transmitting the disease from human beings to rabbits and believes that the virus is transmitted by direct contact. The virus does not penetrate into the interior of the eye. Treatment with antibiotics as well as with cortisone does not influence the course of disease, and the older treatment of frequent irrigations with 3-percent boric acid solution and targesin drops is as good as any of the newer means of therapy.

Max Hirschfelder.

Raimondo, N., and Leo, E. **The pathogenesis of parenchymatous keratitis on the basis of results obtained with local cortisone therapy.** Ann. di ottal. e clin. ocul. **78**:861-874, Oct., 1952.

The authors found local treatment with cortisone, especially when administered early, surprisingly efficacious in eight cases of syphilitic interstitial keratitis. The inflammatory process in this disease seems to start as an infiltration around the anterior ciliary vessels. The beneficial effect of cortisone is attributed to a nonspecific attenuation of the inflammatory process and is not regarded as an expression of interference with immune reactions. (References)

Harry K. Messenger.

Rieger, H. **The differential diagnosis of conjunctival diseases with follicles.** Wien. klin. Wchnschr. **65**:65-67, 1953.

Follicles are formed in a variety of conjunctival diseases. In true trachoma they involve especially the upper lid and are imbedded in a thickened, hyperemic conjunctiva. This condition must be differentiated from the harmless follicular catarrh of school children and from the conjunctival folliculosis of Lindner. The latter is a chronic conjunctival catarrh and is caused by the bacterium folliculosis which is identical with the bacterium granulosis

of Noguchi. Paratrachoma of adults usually follows an inclusion urethritis, is frequently unilateral and takes a rather acute but benign course. Acute edematous conjunctivitis with follicles is caused by a virus and is related to epidemic keratoconjunctivitis. Molluscum contagiosum and herpes febrilis of the lid margin may likewise be accompanied by follicular formations in the conjunctiva. Drug sensitivity and certain chemicals also can cause follicular inflammation of the conjunctival tissues. Max Hirschfelder.

Winter, F. C., and Michler, R. R. **Chronic membranous conjunctivitis.** A.M.A. Arch. Ophth. **49**:161-163, Feb., 1953.

This is a report of two cases of membranous conjunctivitis of unknown origin in siblings. Both cases failed to respond to extensive antibiotic, cortisone, surgical and X-ray treatment. No etiologic agent could be proved. Ocular pemphigus or a similar condition is suspected.

G. S. Tyner.

Zarrabi, M. **A form of follicular conjunctivitis with preauricular adenopathy frequent in Teheran.** Arch. d'opht. **12**:785-790, 1952.

Zarrabi describes a type of follicular conjunctivitis frequent in Teheran that is characterized by 1. monocular occurrence, 2. scanty exudate, 3. preauricular adenopathy painful to palpation, 4. follicular hypertrophy of the conjunctiva with well-defined follicles most numerous in the fornices and resistant to expression, 5. lack of corneal involvement in most cases, 6. absence of pathogenic bacteria, 7. resistance to ordinary conjunctival antiseptics but response to topical penicillin and adrenalin, and 8. normal course of 15 to 20 days if untreated. The author suggests that the condition resembles the conjunctivitis described by Parinaud.

Phillips Thygeson.

8

UVEA, SYMPATHETIC DISEASE, AQUEOUS

Carreras Durán, Buenaventura. **Cysts of the iris and their treatment.** Arch. Soc. oftal. hispano-am. **12**:1363-1376, Dec., 1952.

It is pointed out that these cases are rare, that no standardized method of treatment has as yet been developed, and the treatment of each patient therefore presents an individual problem. A case with several interesting features is reported. A man, 35 years old, developed pain and irritation in the right eye which was injured when he was five years old. A mild ciliary injection was seen and a corneal scar 2.5 mm. in length straddling the limbus at 12 o'clock. A large grayish white cyst filled the upper half of the anterior chamber. With the slitlamp it could be seen that the anterior surface of the cyst was attached to the cornea. Tension and fundi were normal. Removal of the cyst was accomplished in the following steps: a 3-mm. conjunctival flap was made in the upper half of the eyeball; a partial keratotomy ab externo, leaving a thin layer of tissue intact; two small penetrating incisions at 3 and at 9 o'clock with a 2 mm. paracentesis knife; with a small spatula introduced through these incisions the anterior surface of the cyst was successfully separated from the cornea; the keratotomy was then completed with a fine knife, the cyst evacuated, grasped with forceps and completely excised together with the segment of iris to which it was attached. After the cyst was evacuated it was found that the surface of the iris involved was not nearly as large as it appeared to be when the cyst was filled with fluid, and the iridectomy did not have to be extensive. The wound was closed with conjunctival sutures. The interesting features of this case are the length of time which elapsed between the injury and the

development of the cyst, and the fact that in spite of the prolonged contact between the cornea and the cyst wall, inseparable adhesions such as develop from prolonged contact of the iris with the cornea did not develop. The literature on the pathogenesis and treatment of iris cysts is reviewed. (6 figures) Ray K. Daily.

Chinaglia, V. **Congenital aniridia.** Ann. di ottal. e clin. ocul. **78**:469-490, July, 1952.

Chinaglia describes two cases of bilateral aniridia and one case of unilateral aniridia with a coloboma of the iris in the other eye. All three patients had nystagmus and aplasia of the fovea. In the bilateral cases the lenses were dislocated upwards; in the unilateral case the lenses were in normal position but other congenital anomalies were present, such as microphthalmus, microcornea, and a bilateral perilimbal corneal opacity resembling an embryotoxon. Chinaglia reviews the various theories of origin and concludes that aniridia may be due to a chromosomal mutation that behaves as a Mendelian dominant character and affects both mesodermal and ectodermal tissues. (References) Harry K. Messenger.

Klauder, J. V., and Meyer, G. P. **Chorioretinitis of congenital syphilis.** A. M. A. Arch. Ophth. **49**:139-157, Feb., 1953.

This is a report of studies undertaken to determine the incidence of chorioretinitis in children with congenital lues. A review of the literature is included with comparative studies. Of 223 patients with interstitial keratitis, 30 had chorioretinal changes and 18 had perivasculitis. Of 54 patients without interstitial keratitis, 4 had chorioretinitis and 3 had perivasculitis. No cases of retinitis pigmentosa were observed. G. S. Tyner.

Lijó Pavía, J. **Iridoschisis. A new case report.** Rev. oto-neuro-oftal. Sud-am. **27**: 132-137, Nov.-Dec., 1952.

The author provides a short summary of the 15 cases which he has been able to find in the world literature. His patient with myopia of 15 diopters in her only eye had an extracapsular lens extraction with complete iridectomy in 1933. A small amount of posterior capsule remained in the eye. The postoperative course was normal and her visual acuity was 1/10 until 1944. The deficiency of vision can be ascribed to myopic lesions of the fundus. In 1944 slitlamp examination revealed a pigmented membrane covering almost half of the pupillary area, which was a direct extension of the posterior layer of the iris. The membrane increased slowly in size, and in 1949 it practically occluded the pupil. The membrane was extracted with forceps, after a von Graefe knife section from 10 to 2 o'clock, and the patient regained her previous visual acuity. No histologic study of this membrane was made. (9 references, 1 figure) Walter Mayer.

Marsico, Vincenzo. **Melanosarcoma of the ciliary body.** Arch. di ottal. **56**:463-472, Nov.-Dec., 1952.

A typical case of melanosarcoma of the ciliary body with histologic finding of cystic vacuoles under the epithelium and in the tumor itself is reported. Modern theories of the pathogenesis of melanosarcoma are reviewed. (15 references) John J. Stern.

Müller, H., and Piesbergern, H. J. **The pathogenesis and morphology of endogenous uveitis.** Arch. f. Ophth. **153**:333-355, 1952.

More than 100 cases of uveitis were studied histologically. Among them were 59 cases of tuberculous uveitis. The authors summarize their findings, arranging their material into three groups: the metastatic, the anaphylactic and the bacterial allergic uveitis. Referring to the work of A. R. Rich and of A. C. Woods

on the pathogenesis of tuberculosis, the authors state that forces of resistance and of hypersensitivity develop independently from each other. The various conditions produce different pathologic pictures. Metastatic uveitis was usually found to be miliary tuberculosis. Allergic reactions much more often affected the anterior than the posterior portion of the uvea. The changes in the blood vessels seem similar even where the pathogenetic factors differ considerably. (7 figures, 64 references)

Ernst Schmerl.

Piñero Y Carrion, A., and Giménez Muñoz, R. **The syndrome of Vogt-Koyanagi.** Arch. Soc. oftal. hispano-am. **12**: 1402-1407, Dec., 1952.

Bilateral atraumatic painful uveitis and secondary glaucoma in the left eye, and marked unilateral deafness occurred in a 17-year-old boy with the body type of adiposogenital dystrophy of Babinski-Fröhlich, and somewhat low mentality. Therapy for the uveitis was futile. The usual local agents, foreign protein therapy, cortisone, autohemotherapy, nitrogen mustard, and aureomycin were used. The author reports this case as further evidence for the theory that this syndrome includes endocrine disturbances of diencephalic origin. The literature is briefly reviewed. (3 figures) Ray K. Daily.

Ullerich, K. **The eye in epithelioid-cell granulomatosis.** Arch. f. Ophth. **153**: 289-311, 1952.

The common designation epithelioid-cell granulomatosis is given to the three conditions: Besnier-Boeck-Schaumann's disease, Heerfordt's syndrome, and Mikulicz's syndrome. A number of cases are described, and the possibility of a monosymptomatic epithelioid-cell granulomatosis is considered in those types of nodular iritis in which tuberculosis as well as syphilis can be excluded. The Heerfordt and Mikulicz syndrome seem to be limited to the uveal tract, and almost always affect both eyes. The other syndrome involves other parts of the eye as well as the uvea and is often found to be limited to one eye. (56 references)

Ernst Schmerl.

9

GLAUCOMA AND OCULAR TENSION

Glees, M. **Statistical calculations of the normal ocular tension.** Arch. f. Ophth. **153**:356-358, 1952.

In a statistical study of more than 2,500 cases the author found that the normal ocular tension varies between 10 and 30 mg. Schiøtz when taken with the 7.5 gram weight. (3 figures, 1 table, 9 references) Ernst Schmerl.

Kishimoto, M. **Backflow test of aqueous vein.** Acta Soc. Ophth. Japan **57**:204-208, April, 1953.

Jugular veins were compressed by means of a sphygmomanometer. In normal subjects the aqueous stream in the aqueous veins slowed down and finally became reversed when a compression of 30 to 40 mm. Hg was exerted on the jugular vein. In 13 glaucomatous subjects the necessary strength of compression was irregular. It was lower than 30 mm. Hg in 6 cases (lower than 20 mm. Hg in 2 of them) and higher than 40 mm. Hg in 3, and higher than 50 mm. Hg in 4. The lability test of Bloomfield was comparatively studied with the backflow test of the aqueous vein and no correlation was found. Yukihiko Mitsui.

Naccache, R. **Delayed re-formation of anterior chamber after trephine operations.** Brit. J. Ophth. **36**:462-463, Aug., 1952.

The author discusses the Spaeth and the Stallard operations for delayed reformation of the anterior chamber after

trephine operations. A mattress suture is placed horizontally a few millimeters above the trephined hole and the ends anchored in the sclera. The curvature of the globe keeps the thread pressed firmly against the conjunctiva, thereby preventing the aqueous from reaching the area of absorption. Saline solution may be injected into the anterior chamber (Stallard) before tying the suture. The chamber usually re-forms in 48 hours. Interference should not be delayed more than 10 days in cases of delayed re-formation of the anterior chamber. Orwyn H. Ellis.

Siliato, Francesco. **Variations in ocular tension in relation to conditions of illumination.** Ann. di ottal. e clin. ocul. **78**: 625-632, Aug., 1952.

In a study of the ocular tension curves of rabbits, Siliato found that the general level of the curve is lowered by prolonged illumination and raised by prolonged darkness. Administration of trypaflavin, a photodynamic substance, did not affect the level, hence the variations are not to be attributed directly to the increment in luminous energy. Researches at the Genoa eye clinic, as well as others previously recorded in the literature, favor the hypothesis that the variations are due to the action of light upon the neurovegetative nervous system, vagotonia being increased by prolonged illumination and sympatheticotonia by prolonged darkness. (1 graph, references) Harry K. Messenger.

10

CRYSTALLINE LENS

Günther, G. **Histologic findings in lenses which had been intracapsularly extracted.** Arch. f. Ophth. **153**:359-370, 1952.

100 lenses were stained with hematoxylin-eosin or with van Gieson stain. The thickness of the capsule near the anterior pole was 8 to 24μ, there was degeneration as well as proliferation of the epithelial cells, and there were capsular cataracts which arose from epithelial cells. (8 figures, 2 references) Ernst Schmerl.

Upton, A. C., Christenberry, K. W., and Furth, J., with the technical assistance of Thomson, J. R. **Comparison of local and systemic exposures in production of radiation cataract.** A.M.A. Arch. Ophth. **49**:164-167, Feb., 1953.

Experimental studies suggest that cataract induced by irradiation depends upon exposure of the eye itself and not exposure of the remainder of the body. Cataract probably results from irradiation injury to the cells of the anterior epithelium of the lens. No practical protective agent is available other than existing types of shields. G. S. Tyner.

11

RETINA AND VITREOUS

Bonavolontà, Aldo. **Detachment of the retina in young subjects.** Ann. di ottal. e clin. ocul. **78**:603-614, Aug., 1952.

Bonavolontà gives the results of his statistical study of 150 cases of retinal detachment in patients under 30 years of age compared with 150 cases in patients over 40. Fifteen percent of all cases of retinal detachment occur in young people, mostly in myopes (66 percent), and particularly if the myopia is high (28 percent). Almost all cases of disinsertion in youthful emmetropes and hypermetropes have a history of trauma. In the younger group, apart from cases of disinsertion, the retina, even in nonmyopes, was rarely normal, showing extensive atrophic changes, cystic degeneration, and obliteration of vessels. The prognosis in youthful subjects is relatively unfavorable, but with proper precautions the percentage of successful operations should equal that obtained in retinopexies in general. (References)

Harry K. Messenger.

Bonavolontà, Giuseppe. **Retinal tears without retinal detachment.** Rassegna ital. d'ottal. **21**:473-500, Nov.-Dec., 1952.

After carefully reviewing the significance of tears in detachment of the retina, the author considers the question of tears in which there is no separation of the retina. He reports nine cases which were healed by diathermy coagulation and three which remained unchanged for a long time without diathermy and which did not heal spontaneously. The value of early surgical intervention and that of "watchful waiting" are discussed. The evidence points to more favorable results from early treatment of tears not complicated by separation of the retina. (36 references) Eugene M. Blake.

Heinsius, E. **Can the ophthalmologist treat diabetic retinitis?** Wien. klin. Wchnschr. **65**:57-58, 1953.

Treatment of diabetic retinopathy should be directed towards capillary aneurysm and retinal hemorrhages. Regulation of the carbohydrate metabolism, calcium, rutin up to 400 mg. daily, as well as vitamin K are suggested. In order to inhibit the hormone of the adrenal glands and its damaging influence on the retinal capillaries, sexual hormones like testoiron or anertan are given twice a week in doses from 10 to 25 mg. 80 percent of the patients who had this treatment with sexual hormones have not, so far, shown any progress of the retinopathy. Priscolin is suggested as a vasodilator for patients in whom arteriosclerotic retinal changes are predominant. Extensive periphlebitis which leads to preretinal hemorrhages and bleeding into the vitreous may be aided by ¼-percent dionin drops and injections of sodium chloride solution under the conjunctiva. A semi-annual inspection by an ophthalmologist is recommended for all diabetics who had the disease longer than five years. Max Hirschfelder.

Henkes, H. E. **Electroretinogram in circulatory disturbances of the retina.** A.M.A. Arch. Ophth. **49**:190-201, Feb., 1953.

Electroretinograms were made in 63 cases of obstruction of the central retinal vein or one of its branches. No characteristic pattern was found. A + or − electroretinogram was of some prognostic significance. A negative-electroretinogram was typical of total occlusion and a negative + electroretinogram predominates when occlusion is not complete.

G. S. Tyner.

Lijó Pavía, J. **Arteriosclerosis of retina and choroid in generalized hypertension.** Rev. oto-neuro-oftal. Sud-am. **27**:77-91, July-Aug., 1952.

The author emphasizes the growing importance of the ophthalmoscopic consultation for the internist, but warns against making the reports too technical with descriptions. Only the findings which may be helpful for the further prognosis of the patient should be evaluated and if descriptions are absolutely necessary, accompanying retinography should be sent. He analyzes the findings in the arteriosclerotic patient and classifies them into three stages according to the severity of the process. The degree of arteriolar sclerosis present may not be equivalent to the degree of hypertension. He also classifies hypertension in three stages. In the first stage there is slight constriction of arterioles, and the veins underlying arteries at the crossings are not visualized, due to a sclerotic union between them. In the second stage there is tonic contraction of arterioles due to imbalance between blood volume and the essential elements: calcium—potassium; adrenaline—coline; oxygen—carbon dioxide. Silver-wire arteries are the result of an increase in sclerosis which is also the substratum of the crossing phenomena. There may be areas of

anoxia and a few hemorrhages and the electrocardiogram shows coronary sclerosis in 97 percent of these patients. The diastolic pressure in the central retinal artery is slightly higher than normal. In the third stage there is arteriolar contriction with edema of the disc and exudative flat retinal detachment near the disc. Numerous hemorrhages are present in retina and choroid, and if they occur in anoxic areas, they look like "green spots" ophthalmoscopically. Many exudates are present, which may take the form of a macular star. The diastolic pressure in the central retinal artery may be as high as the diastolic humeral pressure. (2 color retinograms, 9 figures, 16 references)

Walter Mayer.

Morpurgo, Fabio. **Clinical examination of the retinal capillaries.** I. Ann. di ottal. e clin. ocul. **78**:841-850, Oct., 1952.

Morpurgo studied the retinal capillaries entoptoscopically and by direct ophthalmoscopy with an arc light and a yellow-green filter. His observations confirm the terminal character of the retinal circulation, but no vascular raphe analogous to that of the optic nerve fibers could be demonstrated. The mean capillary pressure was found to be 35, but with variations in different parts of the retina. (References)

Harry K. Messenger.

12

OPTIC NERVE AND CHIASM

Dolcet, L. **Tubercle of the optic papilla.** Arch. Soc. oftal. hispano-am. **12**:1418-1425, Dec., 1952.

The author treated a number of children who had tuberculous meningitis with the hydrazine of isonicotinic acid, and compared the results with a series in which streptomycin was used. The new drug was found more efficacious. In favorable cases, which formed the majority, improvement was prompt. Choroidal tubercles healed, papillary edema became absorbed, and oculomotor disturbances disappeared. No symptoms of intolerance to the new drug were encountered. The author reports a case of tubercle of the optic papilla, and advances the hypothesis that many cases of papillary edema are caused by tubercles of the papilla behind the lamina cribrosa, or adjacent to it. (2 retinograms)

Ray K. Daily.

Mariotti, Lorenzo. **Retinal adaptation in cases of primary and secondary optic atrophy.** Rassegna ital. d'ottal. **21**:453-472, Nov.-Dec., 1952.

Experiments were made to attempt to determine whether there is a pathognomonic aspect of the curve of adaptation in primary and secondary optic nerve atrophy, and whether treatment is effective. Magiori's photometer and method were used. In primary optic atrophy the curve of adaptation is strongly altered and its elevation is in direct relationship to the ophthalmoscopic appearance. In the postneuritic form the curve is only a little changed and in general shows no relationship to the fundus picture but to the functional disturbance. Treatment of the secondary type may produce a return of the curve of adaptation to normal. (24 references)

Eugene M. Blake.

Nakayama, M. **Melanosarcoma of the optic nerve disc; a case report.** Acta Soc. Ophth. Japan **57**:167-169, March, 1953.

In a 19-year-old woman, when first seen in the clinic complaining of a disturbance of vision (perception of hand movement), the only fundus finding was a slight optic neuritis. When seen 16 weeks later, there was a brown-black tumor of about 3 mm. in diameter on the disc. A slight reduction of the tumor resulted after an X-ray therapy. The eyeball was

finally removed. The tumor proved to be a melanosarcoma primary in the optic nerve. Histopathologic findings are described in detail with a microphotograph.

Yukihiko Mitsui.

Pallarés, J. **Recent cases of optic neuritis of an epidemic character and probably of virus etiology.** Arch. Soc. oftal. hispano-am. **12**:1392-1401, Dec., 1952.

Three cases are reported. One occurred in a man, 62 years old, who developed optic neuritis of the right eye in the course of an attack of grippe. Vision was reduced to finger counting eccentrally. The optic disc was atrophic particularly in the inferior temporal quadrant, there was a superior arciform scotoma extending from the blind spot, and a marked constriction of the 5/330 isopter in the superonasal quadrant. Under treatment with aureomycin, foreign protein, and salicylates vision improved after two months to 1/7. The second patient, a woman, 40 years old, developed a bilateral optic neuritis in association with an attack of grippe. Her central visual acuity was reduced to 0.2; there was a moderate peripheral contraction, a central scotoma, and an inferior arciform scotoma. This patient improved under therapy with colloidal sulphur. A third case of severe bilateral intraocular optic neuritis in a woman, 47 year old, was not followed. (6 visual fields)

Ray K. Daily.

Paterson, Maurice W. **Melanoma of the optic disc.** Brit. J. Ophth. **36**:447-452, Aug., 1952.

A detailed case report of melanoma of the disc is presented. Ophthalmoscopically a large, black, feathery mass obscured the optic disc. A solid detachment was present, which increased in size. Enucleation was performed. The origin of melanomata of the optic disc is discussed. Orwyn H. Ellis.

Wenda, L. **The neurohormonal method of treatment for atrophy of the optic nerve.** Arch. d'opht. **12**:779-781, 1952.

The author reports three cases of optic atrophy treated by ligation of the vas deferens with striking improvement. He considers that the increase in the hormonal activity of the testicle, with simultaneous cessation of spermatogenesis resulting from this operation, has a profound and favorable effect on the whole body. He advocates its use in degenerative lesions of the retina and optic nerve.

Phillips Thygeson.

13

NEURO-OPHTHALMOLOGY

Hermann, P. **Dermatolysis of von Recklinghausen's disease.** Arch. d'opht. **12**:774-778, 1952.

Hermann reports the case of a woman, 40 years of age, with dermatolysis of the eyelids caused by von Recklinghausen's disease. The palpebral deformity started in infancy and at 16 years of age had progressed to a point that justified surgical intervention. Radiographic study of the skull showed abnormally shallow and wide orbits and such other deformities as enlarged sella turcica and poorly developed frontal and ethmoidal sinuses. The typical brown nodular lesions of von Recklinghausen's disease were scattered over the body but the major tumor involvement was of the eyelids. The patient had reduced vision with bitemporal hemianopsia which was believed to be due to a glioma of the chiasm. The author reviews the literature on the common association of glioma of the chiasm with von Recklinghausen's disease and concludes that the disease should be considered a neurogliomatosis. Phillips Thygeson.

Kanner, S., and Herzberger, E. **Arachnoiditis optico-chiasmatica.** Wien. klin. Wchnschr. **65**:61-64, 1953.

Opticochiasmatic arachnoiditis is discussed and illustrated with seven case histories. The etiology was unknown in five of the patients, one case was due to gastro-intestinal infection and one occurred in consequence of skull fracture. The majority of the patients showed primary optic atrophy in each eye. There were two cases with papilledema and fundus hemorrhages. The latter resembled the findings of increased intracranial pressure due to tumor; however the decrease in vision was much more rapid than in choked disc due to intracranial neoplasm. Central and paracentral scotomata as well as peripheral constriction of the field were found in most of the cases described. Cisternography with X ray was negative in one case which on operation had a definite arachnoiditis. The authors recommend early operation for exploration of the chiasmatic area as the best procedure to save the deteriorating sight and as the best means to arrive at a definite diagnosis. (12 references)

Max Hirschfelder.

Pagliarani, Nicola. **Neuro-ocular complications of antirabic vaccination.** Riv. oto-neuro-oftal. **26**:200-212, May-June, 1951.

The author gives a complete review of pertinent literature and adds four cases of his own. Two cases are described with full details. All of the patients had antirabic treatment although in one case the dog proved not to be affected by hydrophobia. In the first case, which came under observation only four months after inception of the eye symptoms, there was bilateral neuritis, right abducens paresis, and slight meningo-encephalitis. The second patient had a mild bilateral optic neuritis and recovered good eyesight; the third had unilateral macular hemorrhages, and the fourth a slow process of serous meningitis. The possible processes of pathogenesis are considered with special emphasis on allergy. (2 figures, 14 references)

Bruno S. Priestley.

Rosetti, Dino. **Retinal arterial pressure in facial palsy.** Riv. oto-neuro-oftal. **26**: 191-199, May-June, 1951.

The author studied the behavior of the retinal arterial pressure with Bailliart's ophthalmodynamometer in several types of facial palsy. He believes that the vegetative fibers carried in the facial nerve have a vasomotor and hypotensive action not only on the facial vessels but also on the retinal vessels. His observation on 56 patients leads him to believe that there is some relation between the site of the lesion and the resulting effect on retinal arterial pressure. If the lesion is below the geniculate ganglion there will be a prevalence of the parasympathetic fibers; if above, the sympathetic will be prevalent. (1 figure, 21 references)

Bruno S. Priestley.

14

EYEBALL, ORBIT, SINUSES

Barth, J. **Leukemia and orbit.** Wien. klin. Wchnschr. **65**:59-61, 1953.

A patient with unilateral exophthalmos and marked chemosis was thought to have a phlegmon of the orbit. Leukopenia, increased sedimentation rate and a reversal of the albumin-globulin relation in the blood was noted at that time. The exophthalmos receded, but two months later the other eye became involved in a similar process. The blood picture revealed a leukocytosis with a marked increase of paramyeloblasts. This case proves that changes in the orbit can be a primary clinical manifestation of leukemia and that the process can be independent of hematologic findings. Both orbits may be involved at different times and the process can be reversible. The article concludes with a discussion of other leukemic pseudotumors of the orbit such as chloroma

and lymphomatosis. (1 table, 12 references) Max Hirschfelder.

Boeck, J. **The enlarged orbitotomy.** Wien. klin. Wchnschr. **65**:51-53, 1953.

An incision which extends from the middle of the eyebrow temporally along the orbital rim and which finally reaches the middle of the lower orbital rim will give access to the contents of the orbit without making a resection of the lateral bony wall necessary. The incision is carried down to the periosteum which is elevated and incised. Two cases are described in which a tumor of the optic nerve was removed by this route with preservation of the eyeball. (40 references)

Max Hirschfelder.

Callahan, A. **Effect of sulfonamides and antibiotics on panophthalmitis complicating cataract extraction.** A.M.A. Arch. Ophth. **49**:212-219, Feb., 1953.

In a series of 1,653 cataract extractions only 5 eyes were lost from panophthalmitis. Pre- and postoperative cultures were taken in all cases in the series. A gram-negative bacillus was identified in each case. Treatment was ineffective despite the use of a variety of antibiotics and sulfonamides. G. S. Tyner.

Cartasegna, Federico. **A case of bilateral malignant exophthalmos.** Ann. di ottal. e clin. ocul. **78**:851-860, Oct., 1952.

Cartasegna describes a case, which he classifies as thyrotropic, of malignant exophthalmos with papilledema. Rapid improvement in vision and reduction in exophthalmos after an exploratory orbitotomy are believed to be more than merely coincidental. (References)

Harry K. Messenger.

Cerabolini, Ernesto. **Monolateral and bilateral ligature of common carotid in the treatment of pulsating exophthalmos.** Riv. oto-neuro-oftal. **26**:181-190, May-June, 1951.

The author reports three cases of ligature of the common carotid aftery for pulsating exophthalmos. In one case of unilateral ligature the result was excellent. In the other two cases, bilateral ligature was performed, in one with a moderate degree of success while the other remainder unchanged. The author is of the opinion that probably in cases of the latter type direct intervention on the arteriovenous fistula would be advisable. (15 references) Bruno S. Priestley.

Esteban Aranguez, M., and Gallego Tejedor, M. **A report of a case of pulsating exophthalmos, caused by a spontaneous fistula between the carotid artery and the cavernous sinus.** Arch. Soc. oftal. hispanoam. **12**:1377-1392, Dec., 1952.

Without any previous history of trauma or exertion, a woman, 53 years old, developed a pulsating exophthalmos of the left eye. The disease is therefore attributed to a saccular aneurysm of the carotid artery in the cavernous sinus. Its partial rupture caused the arterio-venous fistula. The clinical picture was that of exophthalmos, pulsation, bruit, and glaucomatous symptoms. The diagnosis was confirmed by angiography. Matas' test of compression of the carotid did not produce any symptoms of cerebral ischemia. The first surgical procedure consisted of a narrowing of the common carotid with a strip of a fascia lata. In a second procedure, the common carotid was ligated. The symptoms improved significantly after the first operation; the exophthalmos, the intensity of the pulsation and bruit were reduced. The intracraneal tinnitus was relieved to the point where it was tolerable, and the ocular tension was reduced from 55 mm. Hg to 38. Paradoxically, after the complete ligature of the common carotid the symptoms became accentuated. This curi-

ous phenomenon is explained by a retrograde flow of blood into the common carotid from the external carotid and the circle of Willis. The literature on the pathogenesis, the differential diagnosis, the prognosis, and treatment of this disease is reviewed. (5 figures) Ray K. Daily.

Solares, A. **Modification of the technique of amputation of the anterior segment of the eye.** Arch. d'opht. **12**:753-756, 1952.

The author states that amputation of the anterior segment is superior to enucleation in that it provides a base with full motion for the prosthesis. It is indicated in anterior segment conditions such as disfiguring staphyloma, benign tumors of the cornea and limbus, and mutilating injuries. He mentions the importance of a good cosmetic result in the handling of industrial injuries since workers with deformities are under a great handicap in obtaining employment. As contraindications to the operation he lists intraocular tumor or inflammation, and infections of the lids, conjunctiva, or lacrimal apparatus. He describes in detail his modification of the operation of Critchett by which the cornea, the sclera anterior to the muscle attachments, and the ciliary body and iris are excised. A prosthesis can be inserted about 15 days postoperatively.

Phillips Thygeson.

15

EYELIDS, LACRIMAL APPARATUS

Chavarria López, F. F. A. **Epiphora caused by a conjunctival fold formed by lax bulbar conjunctiva.** Arch. Soc. oftal. hispano-am. **12**:1414-1417, Dec., 1952.

The author reports an interesting case of epiphora, which was caused by a fold of bulbar conjunctiva projecting over the edge of the upper lid. The patient, a woman, 66 years old, complained of epiphora of long duration and of a sensation of cold in the eye. She got fleeting relief by pressing the hand over the lids. The fold of conjunctiva, overlying the border of the upper lid, disappeared if the patient looked up, or if the lower lid was pulled away from the globe. Examination of the lacrimal apparatus revealed no abnormality. The author explains the epiphora in the following manner: the fold of conjunctiva exposed to cold stimulated an increase of lacrimal secretion, and interfered with the drainage of tears to the lacrimal lake. Excision of the fold resulted in prompt relief of the symptoms. (1 figure) Ray K. Daily.

Edeskuty, O. **The origin of abnormal positions of the lower lid.** Wien. klin. Wchnschr. **65**:71-73, 1953.

True spastic entropium occurs in younger people. The orbicularis fibers contract and move toward the lid margin, thereby tipping the lid cartilage inward. Senile entropium is not due to spastic contraction. Its primary cause is a loosening of the fixation of the pars palpebralis of the orbicularis muscle at its temporal fixation and the crowding of muscle fibers toward the temporal part of the lid margin. Stretching of the connective tissue connections between cutaneous tissues and lid cartilage finally bring about a turning in of the lid margin. The tarsus may tip in the later stages towards the bulbus, but this is a secondary development. Spastic ectropium is due to stronger contraction of those orbicularis fibers which lie more remote from the lid margin. Paralytic ectropium is the result of gravity. Unlike the latter, senile ectropium does not start in the middle of the lid, but in the nasal region near the lacrimal punctum. At first only the orbicularis fibers of the pars lacrimalis slide down from the tarsal plate during contraction, a process which brings about the

eversion of the punctum. The fibers of the pars palpebralis follow later in the same process with the result that the tarsal plate looses its support and turns outward. (2 figures) Max Hirschfelder.

Henderson, J. W. **Management of obstructions of the lacrimal canaliculi with polyethylene tubes.** A.M.A. Arch. Ophth. **49**:182-184, Feb., 1953.

The most successful results with this tubing were achieved in cases in which reconstruction of the canaliculus was combined with dacryocystorhinostomy. Retained tubing may be cut flush with the lacrimal punctum and should remain from 10 to 36 days to assure permanent reconstruction. The tubing has been left in place for as long as four months without foreign body reaction. G. S. Tyner.

de Roetth, A., Sr. **Lacrimation in normal eyes.** A.M.A. Arch. Ophth. **49**: 185-189, Feb., 1953.

Studies on 827 normal eyes with a modified Schirmer test indicate that any amount of lacrimation is normal for that particular eye if it is functioning without discomfort. G. S. Tyner.

Siliato, Francesco. **Two cases of unilateral palpebral spasm: etiologic considerations.** Ann. di ottal. e clin. ocul. **78**:595-602, Aug., 1952.

Siliato describes two cases of unilateral spasm of the upper lid in patients otherwise normal. Pharmacodynamic tests indicated a spasm of Müller's muscle. A study of the pertinent literature leads to the hypothesis that the clinical picture is linked to the co-existence of an endocrine dysfunction that has its primary seat in the diencephalon, of the type that is found in certain forms of monosymptomatic Basedow's disease. (2 figures, references) Harry K. Messenger.

16
TUMORS

Brand, L., and Kádas, L. **Ocular involvement in myeloid disease of the skin.** Arch. f. Ophth. **153**:312-320, 1952.

A case of a myeloid tumor of the eyelids is reported. (9 figures, 17 references) Ernst Schmerl.

Contino, Filippo. **Epitheliomas of the region of the inner angle of the eyelids (clinical and histologic considerations).** Ann. di ottal. e clin. ocul. **78**:793-840, Oct., 1952.

Contino reports his observations of 12 cases of epitheliomas of the inner angle, which deserve special attention because of their infiltrative character and their proximity to the lacrimal sac, and reviews the literature regarding epitheliomas of the lids in general. Excision is on the whole preferable to radiation, which may cause more or less complete lacrimal stenosis, but no definite rules of treatment can be laid down. (29 figures, references) Harry K. Messenger.

Mathis, G. **A case of juxtapapillary sarcoma of the choroid.** Rassegna ital. d'ottal. **21**:537-547, Nov.-Dec., 1952.

A 54-year-old man observed a scotoma in front of the left eye. There were several small flame-shaped hemorrhages in the retina in the upper temporal quadrant. The optic disc was visible in its upper half and the lower half was covered by a grayish-brown mass, elevated one diopter and round in shape. A round para-central scotoma existed. The growth increased rapidly in size. Microscopically the growth could be seen to have arisen from the choroid at the papillary margin and was sarcomatous in nature. (4 figures, 1 color plate, 16 references) Eugene M. Blake.

Minicucci, Giacomo. **Plurinucleated giant cells.** Rev. oto-neuro-oftal. **26**:222-232, May-June, 1951.

The author describes a rare tumor of the orbit originating from the periorbita of the medial orbital wall. Histologically it was composed of round and spiral cells and many plurinucleated giant-cells. (4 figures, 9 references)

Bruno S. Priestley.

Moro, Ferruccio. **The morphology of malignant melanomas of the choroid. III. The appearance of the tumor as studied in smears. First observations.** Ann. di ottal. e clin. ocul. **78**:615-624, Aug., 1952.

Smears of normal choroid, malignant melanomas of the choroid, and metastatic carcinomas of the choroid were made on microscopic slides in the same way as blood smears, and after fixing and staining were studied in the usual manner. Photomicrographs and brief descriptions are given. Bonavolontà believes that differential diagnosis by this method is quite possible. (References)

Harry K. Messenger.

Wiedersheim, O., and Herzog, W. **Glioma and pseudoglioma, the problem of the pathogenesis of malignant retinoblastoma.** Arch. f. Ophth. **153**:273-288, 1952.

A clinically suspicious eye of a six-months-old baby was removed and studied histologically. The findings were: retrolental connective tissue, a persistent hyaloid artery, a protruding cone-like papilla, abnormal growth of the retinal layers and displaced embryonic cells. So-called retinal rosettes seemed to have formed at an early stage, probably before differentiation of the retinal cells had occurred. The authors feel that a tumor should be called pseudoglioma only if it develops from the same neurogenic tissue as malignant retinoblastoma. (11 figures, 36 references) Ernst Schmerl.

17

INJURIES

Hruby, K. **The value of skiascopy in the evaluation of eye injuries.** Wien. klin. Wchnschr. **65**:69-70, 1953.

Objective cylinder skiascopy should be part of each eye examination in patients who seek compensation for loss after injury. The article cites several cases in which cylinder skiascopy uncovered unilateral refractive errors of high degree, proving that the loss of function was an amblyopia due to anisometropia and was not connected with the injury.

Max Hirschfelder.

Maxwell, J. Preston. **Injury to the orbit.** Brit. J. Ophth. **36**:460-461, Aug., 1952.

While riding in a lorry a branch penetrated the canvas top and struck the patient in the face. It was found that a large piece of wood had penetrated the upper lid, displacing the globe, and had passed through the lower fornix toward the external angle of the right nostril. The vision was good in each eye and there was no damage to the globe. The wound healed promptly without complications.

Orwyn H. Ellis.

18

SYSTEMIC DISEASE AND PARASITES

Fanta, H. **Headaches and eyes.** Wien. klin. Wchnschr. **65**:67-69, 1953.

Ophthalmologic examination may reveal an ocular reason for headache or may give evidence of disturbances elsewhere in the body. Anomalies of refraction, heterophorias, as well as small amounts of paresis of extraocular muscles can cause headaches. Neuralgia of the ophthalmic nerve and various diseases of the eyeball such as uveitis and glaucoma must be considered. Fundus examination and visual field studies aid in cases of brain tumor. Of particular importance in the cause of

headaches is abnormal peripheral blood pressure in the cerebral vessels. The pressure may be estimated by measuring the retinal pressure with the ophthalmodynamometer of Bailliard. Isolated cerebral hypertension or hypotension are frequent. Patients with cerebral hypertension can be relieved of their headaches by sublingual tablets of Hydergin (Sandoz) or by Ronicol. For cerebral hypotension a trial of Effortil (Boehringer) is recommended by the author. (15 references)

Max Hirschfelder.

Iñigo, L. **Some atypical cases of Sturge-Weber syndrome.** Arch. Soc. oftal. hispano-am. **12**:1408-1413, Dec., 1952.

The first patient, a 17-year-old boy, had an angioma of the face over the course of the two superior branches of the trigeminal nerve and glaucoma of the ipsilateral eye. The second case occurred in a 3-year-old child with an angioma of the right side of the face, high myopia and low visual acuity in the right eye, and a posterior capsular cataract and amblyopia of the left eye. The third patient, 20 years old, had an extensive angioma of the face and in the right eye an opaque lens dislocated into the anterior chamber, a focus of angiomatosis in the iris, retinal detachment, and angiomatous formations in the conjunctiva and sclera traversed by large and tortuous vessels. All three patients lacked symptoms of involvement of the central nervous system, although the second patient gave a history of headaches. This case was also atypical in that it was the contralateral eye that was most involved.

Ray K. Daily.

Radnot, M. **The significance of the gonads in the pathogenesis of endocrine exophthalmos.** Wien. klin. Wchnschr. **65**: 55-57, 1953.

The author reports 17 cases of progressive exophthalmos, 13 of which occurred after resection of the thyroid gland. Some of them occurred many years after the original operation for thyrotoxicosis. There seems to be an increase of thyreotropic hormone from the hypophysis during the climacterium and after castration, when the formation of gonadotropic hormone is diminished. This effect becomes accentuated after inhibition of the thyroid gland. (1 table, 21 references)

Max Hirschfelder.

Ström, Torbjörn. **Acute blindness as a post-measles complication.** Acta Paediatrica **42**:60-65, Jan., 1953.

A six-year-old boy became blind over night six days after the exanthem of measles became manifest. The blindness is attributed to encephalitis localized in the eye which is phylogenetically a part of the brain. The retinal vessels were markedly constricted and there was edema and hemorrhage in the retina. The findings in the cerebrospinal fluid and an encephalogram justified the diagnosis of encephalitis.

F. H. Haessler.

19

CONGENITAL DEFORMITIES, HEREDITY

Arjona, J. **The syndrome of Marchesani.** Arch. Soc. oftal. hispano-am. **12**: 1167-1177, Oct., 1952.

The literature on this syndrome, reported by Marchesani in 1939 is reviewed. This syndrome, in contradistinction to that of Marfan, is characterized by a short heavy stature, short extremities, and ocular defects comprizing congenital spheroaphakia and, frequently, juvenile glaucoma. The author reports in detail two cases, that of a brother and a sister, and another case briefly. The brother and sister were the only children out of eight thus affected and their parents were cousins. The father's family were of a tall and strong build, and there was no history

of ocular diseases. The mother's family were of a short and heavy stature, but also without a history of ocular diseases. The girl, 24 years old, short and heavy, gave a history of intermittent acute inflammatory attacks and failing vision, particularly for distance, for 10 or 12 years. After each attack the vision was further reduced. She had a myopia of 50 diopters, and her visual acuity was 1/50 in the right eye. The left eye was blind. The pupils were 6 mm. in diameter, the anterior chambers were deep and there was bilateral iridodonesis. The slitlamp examination revealed an increased curvature of the lens surfaces and with the ophthalmoscope the borders of the lens were distinctly visible in both eyes, but there was no apparent subluxation. In the left eye there was a filtrating cicatrix at the limbus above, similar to that of an Elliott trepanation, although no surgery had been performed. The optic discs had glaucomatous excavations. The ocular tension was 25 mm. Hg in the right eye, and 12 in the left. The brother of this patient, 29 years old, was of the same general build and gave a history of progressive myopia for twenty years. He had myopia of 14 diopters in the right eye, with a visual acuity of 1/3, and 17 diopters in the left eye with 1/10 vision. The anterior chambers were shallow, the iris was pushed forward, the pupils were contracted, and there was no iridodonesis. Ophthalmoscopically the borders of the lens were distinctly visible, the optic discs were normal, and there were some myopic fundus changes. Marchesani considers the glaucoma in these cases secondary and mechanical in origin. The increased curvature of the lens pushes the iris forward, blocking the angle of the anterior chamber. At some subsequent period, if the lens becomes slightly luxated backwards, the elevation of ocular tension may subside. The case reported briefly is that of a girl, 16 years old, whose parents were second cousins. She had four brothers, one of whom had a vertical nystagmus. She became blind after recurrent acute inflammatory attacks of glaucoma over a period of two years. (7 figures, 6 references) Ray K. Daily.

Cosmettatos, G. F. **Albinism.** Arq. portug. de oftal. **4**:51-58, 1952.

Albinism is a congenital anomaly which is particularly rare in man; only five cases were seen in almost one million admissions to the eye clinic in the University of Athens. Because of this rarity, few reports of the microscopic findings have been recorded even though the anomaly has been recognized for centuries. The author describes the histologic findings of an albinotic eye. In general the ocular tissues were considered to be normal with the sole exception of the absence of pigment. Microscopic evidences of pigment were identified as fine grains, seen in the epithelial external layers of the ciliary processes, the anterior layer of the iris, and in the anterior extremities of the pigment epithelium of the retina.

Albinism is a familial disease, intermittently hereditary, of a recessive type. In partial albinism, however, the transmission may be dominant, recessive, or sex-linked.

Pigmented tissue is not of mesenchymal origin, but is derived from the primitive nervous system. It is found first in the region of the medullary plaque and groove, from which it migrates to different parts of the body. Those tissues of the eye which are pigmented are not pigmented simultaneously. Investigations have indicated the presence of promelanin in the ocular tissues of albinos, and thus it is concluded that the anomaly is due to an incomplete development of pigment rather than an agenesis in early embryonic life when the tissue normally

separates from the medullary plaque and groove. The actual cause of this faulty development is obscure. (2 references)

James W. Brennan.

Durham, D. G. **Cutis hyperelastica (Ehlers-Danlos syndrome) with blue scleras, microcornea, and glaucoma.** A.M.A. Arch. Ophth. **49**:220-221, Feb., 1953.

This case is reported because of the unusual combination of cutis hyperelastica, blue sclera, microcornea and glaucoma.

G. S. Tyner.

François, J., and Bello, D. **The syndrome of Laurence-Moon-Bardet-Biedl.** Ann. d'ocul. **185**:944-960, Nov., 1952.

Most ophthalmologists are unfamiliar with the great variations that exist in the ocular manifestations of this interesting syndrome. The basic anomalies include dystrophies in the eyes, genitals, skeleton, nervous system and fat metabolism. Although the classical form of retinal pigmentary degeneration is usual, atypical forms of structural abnormalities are not infrequent. Abnormal pigmentation may be slight or absent as in retinitis punctata albescens. The primary location of the lesion may be peripheral, equatorial, central or quadrantic. The adjoining choroid may be involved in varying degrees as in choroideremia, and the optic nerve alone may harbor the only defect, a primary optic atrophy. Fundus changes may be associated with or replaced by external ophthalmoplegia, microphthalmus, iris coloboma and other abnormalities. Transmission is principally by recessive heredity and through polyphenic genes. The incomplete forms of the syndrome are manifestations of a heterozygous state and complete forms of a homozygous state. The greater frequency in men is apparently due to the decreased penetrance of the genetic abnormality in women. The abnormal genetic activity becomes manifest in the first two months of embryonic life. (3 figures, 6 references)

Chas. A. Bahn.

Hofstetter, H. W., and Rife, D. C. **Miscellaneous optometric data on twins.** Am. J. Optometry **30**:139-150, March, 1953.

Various refractive and anatomical data were taken on 27 identical and 12 fraternal twins. The types were determined by hand prints, blood types, pigmentation, skeletal type, features, and the history of fetal membranes. Most were of college age. Statistically, one could not have determined the type of twinship on the basis of pupillary distance, heterophoria, vergences, accommodation-convergence ratio, corneal power, corneal astigmatism, or the refraction. The refraction showed a higher correlation in the identical twins than it did in the fraternal, but there was no correlation in the shape of the cornea. In all parts of the examination, identical twins showed correlations equal to, or higher than those of fraternal. The data suggest, but do not prove, that astigmatism is acquired, while refractive error is inherited.

Paul W. Miles.

Palich-Szanto, Olga. **Developmental anomalies of the optic nervehead.** Klin. Monatsbl. f. Augenh. **121**:428-434, 1952.

In both eyes of a 15-year-old boy the discs were oblique and the lower half was missing. The vision was nearly normal in both eyes. The author suggests that the anomaly may be ascribed to an increased density of the cribriform plate which might prevent the myelin sheaths from reaching the optic nervehead. (1 figure, 5 references)

Frederick C. Blodi.

Salvi, G. L. **Status dysraphicus with ocular signs.** Boll. d'ocul. **31**:752-761, Dec., 1952.

A 15-year-old girl with negative family

history showed facial hemiatrophy, wryneck, dorsal scoliosis, funnel breast, elongated arms, scapulae alatae, pes varus, contractions of the palmar aponeuroses, hemihyperhydrosis, enuresis, asymmetry of size and pigmentation of the breasts, and changes in sensitivity; ocular signs were ectopia of the pupils, heterochromia of the irises and Horner's syndrome. At the age of 15 years, motor disturbances suddenly began. The relations between status dysraphicus and syringomyelia are discussed and the literature is reviewed from the time when Bremmer first described status dysraphicus (1926). (2 photographs, 1 X-ray picture)

K. W. Ascher.

20

HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Biernacka-Biesiekierska, Jadwiga. **Observations on diseases of the eye caused by dust.** Klinika Oczna **22**:169-179, 1952.

The author investigated closely the conditions of work in the production of powder for washing, from the point of view of injury caused by the dust. Thirty-seven workers were examined. Their age range was from 19 to 61 years and the length of employment in the same plant from 2 weeks to 26 years. Careful history was taken with emphasis on pneumoconiosis and allergy. The lids were checked for scars on the margin, trichiasis, lacrimal puncti and meibomian glands. In early cases the conjunctiva was congested. In the old ones it was thickened, uneven, with scant secretion. The cornea was checked for sensitivity and scars. Schirmer's test was done on all cases and the patency of tear duct was examined. Sixty-eight percent of the subjects had symptoms of dust irritation. There was a definite relation between the time of employment and the presence or severity of the disease. Allergy to soap was found in over 50 percent of those examined. The tears were found to be more acid than normal. Nine illustrative cases are described. The author found a definite relation between the symptoms and complaints of the workers and the duration of the employment.

Sylvan Brandon.

Crane, M. M., Scobee, R. G., Foote, F. M., and Green, E. L. **Study of procedures used for screening children for visual defects: referrals by screening procedures versus ophthalmological findings.** Am. J. Pub. Health **42**:1430-1439, Nov., 1952.

Six hundred nine, sixth grade and 606 first grade pupils were examined. After ophthalmic examination with refraction, 31 percent of the pupils were referred to their family ophthalmologist. Using the Bausch and Lomb orthorator, American Optical Co. sight screen, and the telebinocular, 23 to 25 percent or ¾ of the 31 percent of the students were referred. The judgement of the teacher and the high-standard near vision test (Lebensohn chart for the sixth graders and the Guibor chart for the first graders) compared well with the use of the more elaborate instruments. The vision tests are at best a rough screening procedure. (2 references)

Irwin E. Gaynon.

Foster, John. **Doyne memorial lecture. Aims and obstacles in the ophthalmic clinic.** Tr. Ophth. Soc. U. Kingdom **71**: 499-560, 1951.

The author questions the practicality of many of the routine office and hospital procedures because of the time consumed and the cost. He suggests that the care in the office, clinic and hospital should be studied in this era of a contracting economy in order to ease the doctor's work in the individual case and to increase his output. We must select our tests as an effi-

ciency engineer would, omitting the time-consuming tests that do not add to our knowledge. (36 figures)

Beulah Cushman.

Funder, W. **The development of ophthalmology as mirrored in the casuistic of the Second Eye Clinic in Vienna.** Wien. klin. Wchnschr. **65**:73-75, 1953.

The hospital admissions in the Second Vienna Eye Clinic for the years 1883, 1906, 1929 and 1951 are statistically compared in the article. Inflammations of the anterior segment, especially trachoma, have markedly decreased. Perforating injuries are less than in former years. The number of patients with surgical ocular diseases such as cataract, glaucoma, and detachment increased during the period. Uveitis stayed about the same. The average length of hospitalization decreased from 40 days to 15 days. (5 tables) Max Hirschfelder.

Holiday, J. L. **Ophthalmology and psychosomatic medicine.** Tr. Ophth. Soc. U. Kingdom **71**:341-349, 1951.

The author makes clear what is intended by the term psychosomatic medicine. The number of patients with shell shock after World War I brought the subject to practical importance. Numerous studies have indicated its importance in respect to such common diseases as fibrositis, duodenal ulcer, recurring bronchitis, coronary thrombosis, rheumatoid arthritis, spastic colon, certain diseases of the skin, obesity, and glaucoma. Psychosomatic affections are usually phasic in their occurrence. The author states that he has often found it useful to say in a quiet way after the physical examination: "In my experience a disturbance such as yours often comes on at a time of stress, distress, strain or upset. Does this happen to apply to you?" Then the patient may be led to see that his problem is not so much a problem of his eyes as of his life.

Beulah Cushman.

Lang, R. **An experiment in ward lighting.** Tr. Ophth. Soc. U. Kingdom **71**:563-571, 1951.

The author has studied the lighting of hospital wards during the day, evening and night and makes definite practical recommendations. (4 figures, 1 table, 2 references) Beulah Cushman.

Law, Frank W. **Ward lighting.** Tr. Ophth. Soc. U. Kingdom **71**:573-581, 1951.

The author discusses the use of fluorescent lighting from the ceiling with individual bed lamps and the cost of installation and operation. (5 figures, 2 tables) Beulah Cushman.

Wilkowa, Maria. **Results of ophthalmological examinations in the institute for blind children in Lodz.** Klinika Oczna **22**: 235-238, 1952.

On examining 42 children in the institution for the blind, the author found nine who could see better than 1/50 and should have been taught in special schools for children with poor vision. In six children congenital and complicated cataracts were found. Appropriate surgical intervention could improve their vision. The author compares her results with previous surveys as to the cause of blindnes and suggests that the candidates for the institution for the blind should be examined by an ophthalmologist before admission.

Sylvan Brandon.

NEWS ITEMS

Edited by Donald J. Lyle, M.D.
601 Union Trust Building, Cincinnati 2

News items should reach the editor by the 12th of the month but, to receive adequate publicity, notices of postgraduate courses, meetings, and so forth should be received at least three months before the date of occurrence.

Deaths

Dr. John Norris Evans, Brooklyn, New York, died April 9, 1953, aged 62 years.

Dr. Emanuel L. Falk, Brooklyn, New York, died March 20, 1953, aged 68 years.

Dr. Frederick Andrews Kiehle, Palo Alto, California, died March 22, 1953, aged 80 years.

Dr. Eugene Richards Lewis, Los Angeles, California, died March 18, 1953, aged 75 years.

Dr. Oliver Francis Mershon, Philadelphia, Pennsylvania, died February 22, 1953, aged 79 years.

Dr. George Hocken Thompson, Pittsfield, Massachusetts, died March 8, 1953, aged 76 years.

Dr. Joshua Warren White, Norfolk, Virginia, died March 4, 1953, aged 77 years.

Announcements

Retina service fellowship

This fellowship has been created by the Retina Foundation and will be granted to a young ophthalmologist from the United States, or abroad, who wishes to be trained for six to 12 months at the Retina Service of the Massachusetts Eye and Ear infirmary. The remuneration will amount to $1,000 per annum, plus room, board, and laundry at the infirmary.

Training covers methods of examination of the extreme fundus periphery and the vitreous; use of the indirect stereoscopic ophthalmoscope and scleral depressor; and surgical procedures for cases of retinal detachment. Original research work of clinical nature will be encouraged. The only candidates who are eligible are those who have completed a residency in ophthalmology or have had comparable training.

Applications accompanied with a biography and at least two references should be mailed to:

Dr. E. B. Dunphy
Chief of Ophthalmology
Massachusetts Eye and Ear Infirmary
243 Charles Street
Boston 14, Massachusetts

Establishment of Transplantation Bulletin

Within recent months efforts have been under way to increase the exchange of information in the field of tissue transplantation among investigators in laboratories and those at the bedside. At recent conferences, workers in plastic surgery, cancer, zoology, and other fields, in discussing common problems in tissue transplantation, felt that some means should be provided for further continuous exchange of information on an informal basis among investigators in the clinic and the laboratory interested in problems of tissue transplantation.

To meet this need, it is proposed to issue a quarterly *Transplantation Bulletin*. This bulletin will serve several functions.

1. It will maintain, and publish at least once yearly, a Transplantation Registry which will list all practicing physicians and research workers, both in the United States and abroad, interested in transplantation problems. The registry will cover the fields of plastic surgery, endocrinology, cancer, genetics, immunology, experimental morphology, and so forth.

2. The *Bulletin* will provide a medium for a rapid and informal exchange of information on problems and progress in the clinics and laboratories both here and abroad. It is emphasized that the *Bulletin* will not publish formal papers. However, brief comments on unreported data will be welcomed.

3. It will, through a staff of corresponding editors, attempt to keep all members of the Transplantation Registry informed of forthcoming meetings of the professional societies, at which there will be presentations dealing with any aspects of transplantation. It will also try, through its corresponding editors, to have the subjects covered in a coördinated fashion at the meetings.

4. It will maintain a bibliography in the fields listed in item 1 (above).

The *Transplantation Bulletin* hereby extends an invitation to all workers in the fields of medicine and biology interested in tissue transplantation, to submit their name and field of interest to E. J. Eichwald, M.D., University of Utah College of Medicine, Salt Lake City, Utah. A subscription fee of $3.00, to cover the expenses of printing the *Bulletin* and maintenance of the registry and bibliography, will be payable after the first issue of the *Bulletin* has appeared. The first issue is expected to appear in August, 1953.

Wills 1954 conference

The sixth annual clinical conference of the Wills Eye Hospital will be held on February 19 and 20, 1954. Color television sponsored by Smith, Kline, and French will again be a feature of the program.

Course on glaucoma

A course on glaucoma with particular emphasis on gonioscopy and study of the anterior angle will be given at the Brooklyn Eye and Ear Hospital on November 16, 17 and 18, 1953. Ample opportunity

for practical instruction in the use of the goniolens will be given and material from the Glaucoma Clinic will be utilized. One afternoon will be devoted to surgical indication and technique of glaucoma surgery in the operating room.

This course will be given by Dr. Daniel Kravitz and staff. Application and the fee of $40.00 for registration by ophthalmologists may be addressed to Dr. Daniel Kravitz, Brooklyn Eye and Ear Hospital, 29 Greene Avenue, Brooklyn 38, New York.

Miscellaneous

Manoel A. da Silva Foundation

On May 15, 1953, a photograph of Dr. Manoel A. da Silva was hung in the room which bears his name, that is, in the library of the Ophthalmological Study Center (São Paulo, Brazil).

On this occasion Dr. Jair Xavier Guimarães in the name of Manoel A. da Silva's medical school classmates reminded those present of Dr. Silva's record up to the time of his death in 1950, at the age of 36 years. Dr. Renato de Toledo, chief of staff of the Department of Ophthalmology of the Escola Paulista de Medicina, also said a few words about the deceased. Prof. Moacyr E. Alvaro, director of the Department of Ophthalmology of the Escola Paulista de Medicina, then referred to the generous gesture of Dr. Manoel A. da Silva's parents, who have willed their entire estate for the establishment of the Manoel A. da Silva Foundation, which is dedicated to the advancement of the teaching of ophthalmology. The Manoel A. da Silva Foundation, which in the future will be well endowed, will carry out its work through the Ophthalmological Study Center and the Department of Ophthalmology of the Escola Paulista de Medicina.

Societies

Chicago Ophthalmological Society

New officers of the Chicago Ophthalmological Society for 1953-1954 elected at the annual business meeting are: President, Dr. Gail R. Soper; vice-president, Dr. Karl J. Scheribel; recording secretary, Dr. Richard C. Gamble; councilor, Dr. Robert J. Masters; secretary-treasurer, Dr. Frank W. Newell.

Los Angeles meeting

The annual meeting of the Pacific Coast Oto-Ophthalmological Society was recently held at the Ambassador, Los Angeles, under the presidency of Dr. C. Allen Dickey, San Francisco.

Among those presenting papers were: Dr. Thomas C. Stevenson, Menlo Park, California; Dr. Daniel G. Vaughn, Jr., San Jose, California; Dr. Thomas E. Douglas, Jr., Seattle; Dr. Samuel L. Perzik, Beverly Hills; Dr. Henry B. Perlman, Chicago.

St. Louis Ophthalmological Society

The name of the St. Louis Ophthalmic Society has been officially changed to the St. Louis Ophthalmological Society. At the annual business meeting, the following slate of officers was elected for the year 1953-54: President, Dr. Harry Rosenbaum; vice-president, Dr. James Bryan; treasurer, Dr. Ruth Freedman; secretary, Dr. Anton J. Hummel; member-at-large, Dr. Robert D. Mattis.

Kansas City officers

The following members have been elected to be the 1953-1954 officers of the Kansas City Society of Ophthalmology and Otolaryngology: President, Dr. James W. May; president elect, Dr. William B. Barry; vice-president, Dr. William M. Scales; secretary, Dr. Will R. Eubank; treasurer, Dr. Fred Bosilevac.

Georgia officers

The following officers of the Georgia Society of Ophthalmology and Otolaryngology were elected for the coming year: Dr. W. Eugene Matthews, Augusta, president; Dr. J. Kirk Train, Savannah, vice-president; Dr. Alton V. Hallum, Atlanta, secretary-treasurer.

Personals

Dr. Frank W. Newell, associate in ophthalmology at Northwestern University Medical School, has been appointed chairman of the Division of Ophthalmology and associate professor of ophthalmology at the University of Chicago.

Dr. Jack S. Guyton, Baltimore, has been appointed head of the eye department, Henry Ford Hospital, Detroit.

At the annual meeting of the Rochester Academy of Medicine, Dr. Albert C. Snell, Sr., Rochester, a former chairman of the A. M. A. Section on Ophthalmology, was awarded the Albert David Kaiser medal. Dr. Snell is the author of *Industrial Ophthalmology* and has published many articles in medical journals. He is a past president of the Monroe County Medical Society and has served as secretary and president of the American Academy of Ophthalmology and Otolaryngology.

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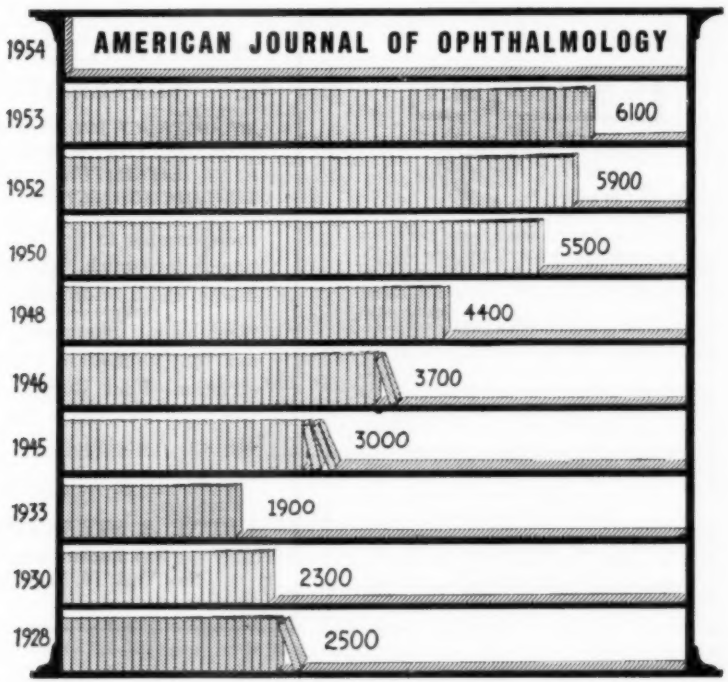

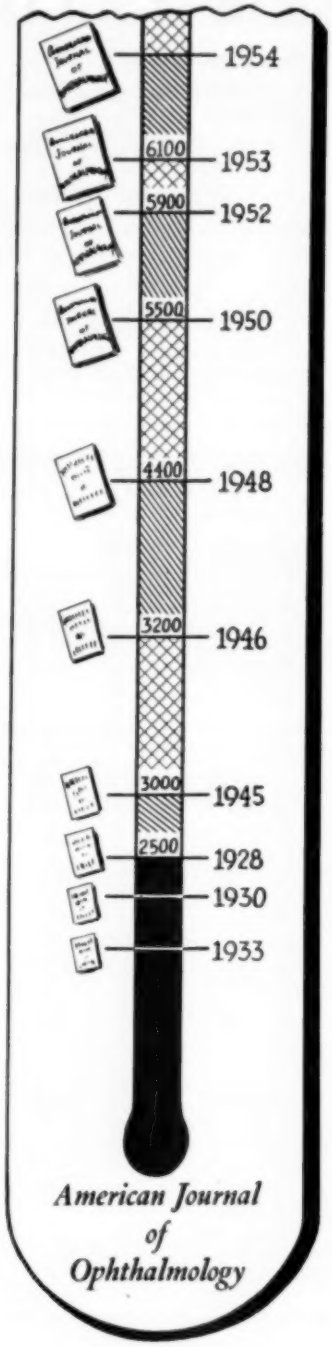
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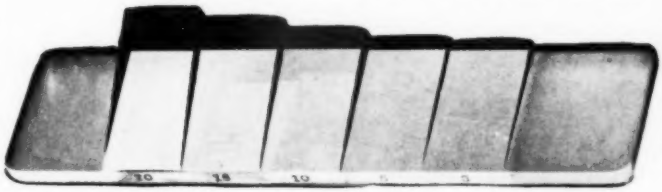

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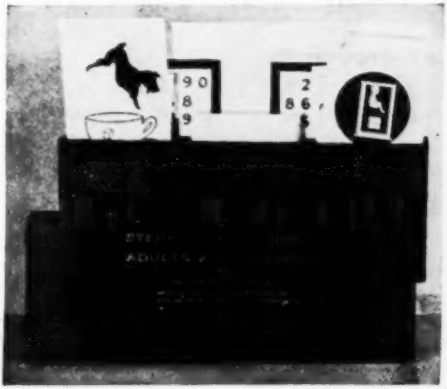

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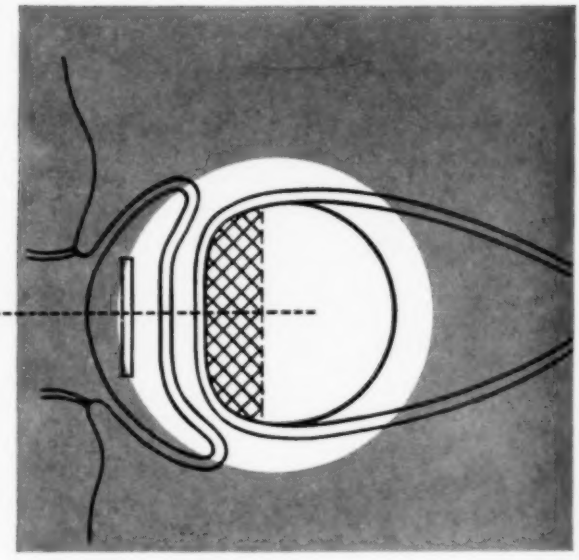

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DEPARTMENTS

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